

The Journal *of the* SOCIETY OF DYERS AND COLOURISTS

Volume 69 Number 2

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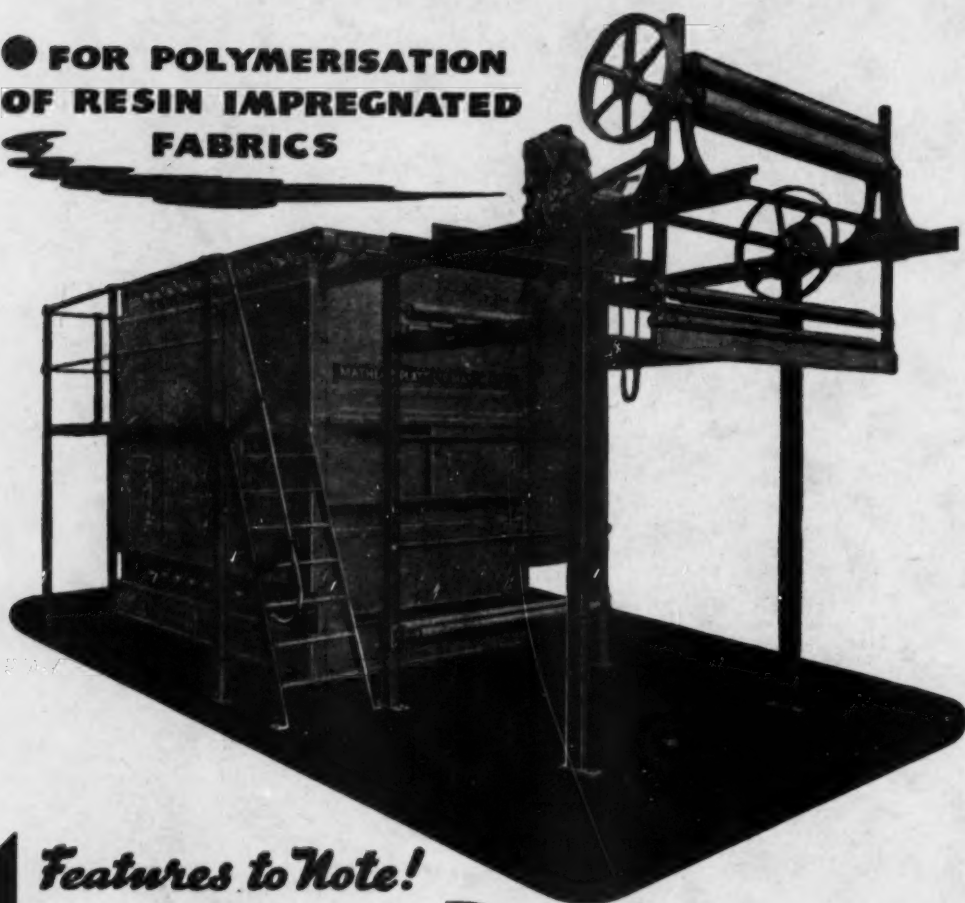
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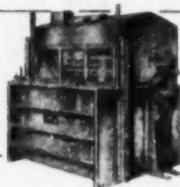
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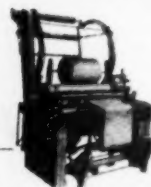
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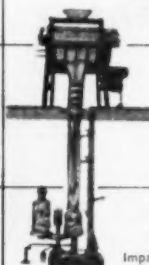
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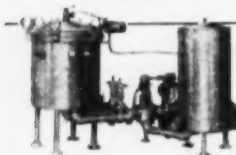
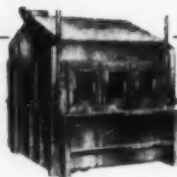
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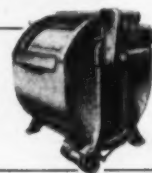
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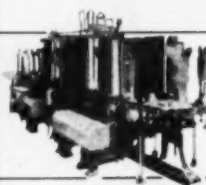
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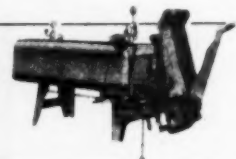
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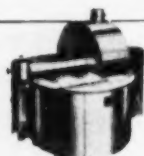
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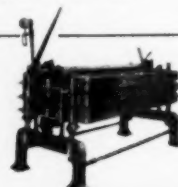
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NOTICE TO MEMBERS AND SUBSCRIBERS

Readers requiring general information regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1-6 of the January 1953 and pages 237-240 of the July 1952 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford, Yorkshire (Telephone Bradford 25138-9). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

Defective Colour Vision F. Jordonson

Fluorescent Dyes and the Application of Fluorescence
to Textiles T. Thorne Baker

COMMUNICATIONS

Zacharie Roussin R. Brightman

The Dyeing of a Blend of Wool and Fibrolane for
the Hand-knitting Trade R. C. Cheetham

Studies in the Fundamental Processes of Textile Printing.
V—The Transfer of Disperse and Water-soluble
Dyes to Cellulose Acetate during Steaming
E. H. Daruwalla and H. A. Turner

An Electron-microscopic Examination of Wool—
The Fraction resistant to Peracetic Acid-Ammonium
Hydroxide Treatment R. L. Elliott and B. Manogue

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Forthcoming Meetings of the Society

Friday—27th March 1953

THIRD GEORGE DOUGLAS LECTURE Dr. T. Holbro *The Search for New Dyes in Relation to Modern Developments in the Textile Field* The University, Leeds

Thursday—9th April 1953 at 7-30 p.m.

TENTH MERCER LECTURE J. R. Blockey, M.Sc., F.R.I.C., and D. H. Tuck, A.L.C. *The Coloration of Leather* Royal Institution, Albemarle Street, London W.1

Friday—10th April 1953

ANNUAL GENERAL MEETING and DINNER of the Society May Fair Hotel, London W.1

MANCHESTER SECTION

Unless otherwise stated meetings are held in the Textile Institute, 10 Blackfriars Street, Manchester 3, and commence at 6.30 p.m.

1953

Friday 13th March Manchester College of Technology. Afternoon and Evening Symposium on *New Fibres*. Details to be announced later

Friday 20th March Joint meeting with the British Association of Managers of Textile Works. Midland Hotel, Manchester. Lecture by Dr. Fargher (Shirley Institute). Details to be announced later

Friday 17th April **ANNUAL GENERAL MEETING.** Details of lecture to be announced later

NORTHERN IRELAND SECTION

1953

Wednesday 11th March Dr. B. C. Gee. *The Educational Side of Textile Processing*

March/April **ANNUAL GENERAL MEETING and DINNER** (date will be announced later)

LONDON SECTION

All meetings held at 6 p.m. in the Rooms of the Royal Society, Burlington House, Piccadilly, London W.1, unless otherwise stated

1953

Friday 6th March Title to be announced later

MIDLANDS SECTION

Except when otherwise stated, Lecture Meetings commence at 7 p.m.

1953

Wednesday 25th Feb. E. R. Wiltshire, Esq., B.Sc. *Azoic and other Fast Dyes on Knitted Cotton Fabric*. College of Technology, Leicester

Friday 13th March **MIDLANDS SECTION DINNER.** Royal Hotel, Leicester

Wednesday 18th March G. H. Osborn, Esq., F.R.I.C., A.M.Inst. M.M. *Colour in Chemistry* (Joint meeting with the British Association of Chemists). School of Arts and Crafts, Derby

Wednesday 22nd April **ANNUAL GENERAL MEETING of the SECTION.** Gas Board Theatre, Nottingham

Towards the end of the session Dr. H. White (Textile Research Institute, Princeton, U.S.A.) will lecture in Nottingham. Particulars later

HUDDERSFIELD SECTION

All meetings held at Field's Cafe, Huddersfield, at 7.30 p.m., unless otherwise stated

1953

Tuesday 17th March Dr. H. A. Thomas (Courtauld). *The Role of Dyeing, Printing, and Finishing in Fabric Development*

Tuesday 7th April **ANNUAL GENERAL MEETING** followed by a lecture—Dr. J. F. Gaunt. *A Study of the Afterchrome Process of Wool Dyeing*

SCOTTISH SECTION

All meetings at St. Enoch Hotel, Glasgow, 7 p.m., unless otherwise stated

1953

Tuesday 17th Mar. **ANNUAL GENERAL MEETING**, to be held at the ROYAL TECHNICAL COLLEGE, GLASGOW at 7 P.M. and NOT at the ST. ENOCH HOTEL as previously announced. To be followed by *Brains Trust* at 7.30 p.m.

The Panel is to be formed from Sectional Members and details will be circularised later. By courtesy of the College Authorities an invitation has been extended to inspect the new laboratories on this occasion

MANCHESTER JUNIOR BRANCH

All meetings commence at 6.30 p.m. in the Reynolds' Hall, College of Technology, Manchester.

1953

Monday 2nd March Title to be given later.

LEEDS JUNIOR BRANCH

All meetings to be held in the Colour Chemistry Lecture Theatre, The University, Leeds, 2 on Tuesdays at 4.0 p.m.

1953

3rd March D. Hanson, Esq., B.Sc., F.R.I.C. (J. Crowther & Sons Ltd.). *A Chemist in the Woollen Industry*

WEST RIDING SECTION

All meetings held at the Victoria Hotel, Bradford, at 7.15 p.m. unless otherwise stated

1953

Monday 23rd Feb. N. R. Hjort, Esq. *Water Treatment*. (Joint lecture with the Halifax Textile Society). Alexandra Cafe, Halifax

Thursday 26th Feb. J. V. Summersgill Esq. (Geigy Co. Ltd.). Title later

Tuesday 3rd March Dr. H. Baines (Kodak Ltd.). *Colour Photography*. The University, Leeds

Thursday 12th March Dr. J. F. Gaunt (Patons & Baldwins Ltd.). *A Study of the Afterchrome Process of Dyeing Wool*

Thursday 26th March **ANNUAL GENERAL MEETING**

BRADFORD JUNIOR BRANCH

All meetings held in the Bradford Technical College at 7.15 p.m.

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Thursday 26th Feb. **JUNIOR BRANCH DANCE** at the Queens Hall

Friday 13th March **STUDENTS' ANNUAL COMPETITION EVENING**

Thursday March 26th **FILM EVENING**

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THE JOURNAL

OF THE

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Volume 69 Number 2

FEBRUARY 1953

Issued Monthly

Proceedings of the Society

A Survey of the Quality of Crease-resist Treatment on Fabrics supplied to the Retail Trade

H. W. BEST-GORDON

Meetings of the Northern Ireland Section held in the Queens Hotel, Belfast, on 17th January 1951, Mr. D. A. Derrett-Smith in the chair; and of the Manchester Section held in the Gas Showrooms, Manchester, on 16th March 1951, Mr. R. J. Hannay in the chair

The application of resin finishes to textile fabrics raises many interesting problems, and it was felt that a survey of the actual quality of finished fabrics supplied to the retail trade would provide interesting data. A detailed investigation was carried out on 260 fabrics crease-resisted with urea-formaldehyde resins. The results are summarised, and observations, of interest to the technician, are made on the possible causes of some of the more outstanding faults.

The most important factor, from a consumer's point of view, is the ability of the fabric to recover from creasing; next comes wash fastness (in retention of colour, overall fabric dimensions, and crease-resistant properties), followed by fastness to light, and the degree of freedom from chemicals which have been used in the process.

The survey has shown that some fabrics could be regarded as quite satisfactory, and that a great many could have been considerably improved by adequate process control. On the other hand, a number were regarded as completely unsatisfactory.

Those fabrics with a crease-recovery of the order of 90-0% which were wash fast, dimensionally stable, dyed with dyes of good light fastness, and with a relatively low free formaldehyde figure were considered to be satisfactory. Failure in any one item of the foregoing was regarded as an undesirable feature.

Introduction

The application of synthetic resins to various types and qualities of fabric, which may be carried out for one purpose or another, has now become accepted textile-finishing practice. Many resins have been proposed to cover a wide range of finishes, and there can be no doubt that their use has now become firmly established. The outstanding development in this direction has been the application of resins of the urea-formaldehyde type to give improved resistance to creasing. Whilst the process has become well known, it is not always realised that only a few years ago it was virtually impossible to improve the crease-resistance of fabrics made from cellulosic fibres, so that they bore some resemblance, in crease-recovery properties, to fabrics made entirely from silk or wool.

Very little technical detail concerning the crease-resist process appeared in the literature before 1937. Between 1937 and 1949 about 240 references have been noted, consisting for the greater part of technical papers and patents¹, and in some references the process has been described in detail²⁻⁵.

The majority of the papers have dealt mainly with methods of testing, primarily the assessment

of the resistance to creasing imparted by the resin treatment.

Therefore, whilst much appears to have been written on the various aspects of the process, when the patent literature is examined, the examples given are found to have been prepared to demonstrate certain improvements achieved by the use of specialised resin treatments. In all the examples of claimed improvement, results have been confined to one or two fabrics, which, in the majority of cases, are treated in the laboratory and therefore cannot be regarded as representative of commercial practice. No attempt has previously been made to carry out a survey of the actual quality attained commercially. A programme was therefore arranged whereby it was possible to make a detailed examination of the quality of fabrics supplied to the retail trade.

To obtain the necessary information, a large number of commercially produced crease-resisted fabrics had to be collected. It was decided to examine the fabrics from a consumer viewpoint and to ignore the particular method by which they had been produced; nor was it intended to make a comparison of any one finisher with another, in an

attempt to establish what method or which finisher produced the superior result.

With this in mind, 260 fabrics—plain-dyed, woven stripes, and printed—made from rayon or mixtures thereof, were tested. The samples were obtained, over a period of about four years, from various sources, such as dyers' merchants, converters, makers-up, wholesale houses, and retail shops. A number of samples were also obtained from similar sources in America, France, Italy, and Sweden.

The type of fabrics selected were those intended for use as wearing apparel and may be described in the following manner—

- 35% were of viscose rayon staple or mixtures thereof and made from yarns spun on the cotton spinning system
- 20% were of viscose rayon staple or mixtures thereof and made from yarns spun on the woollen or worsted spinning system
- 35% were of viscose rayon staple and made from yarns spun on the flax spinning system
- 10% were of viscose rayon staple mixed with continuous filament, or in some cases were composed entirely of the latter

Any fabrics which were found to have been finished by the use of resins other than the urea-formaldehyde type were discarded and not included in the survey.

The test methods used throughout the survey are given in detail in *The Fibro Manual*⁶.

The crease-resist process is carried out in three stages—

- (A) Impregnation of previously prepared dry fabric with a solution of a partly condensed water-soluble urea-formaldehyde and a catalyst
- (B) Drying to width
- (C) Polymerisation of the resin by baking.

After these treatments, the fabric is lightly scoured, and finally dried to width on a stenter⁵.

Whilst the process may be regarded as relatively simple in its application, it is essential to remember that a large variety of compounds may be formed when formaldehyde reacts with urea. The products of this reaction depend on the hydrogen-ion concentration, the ratio of formaldehyde to urea, and the temperature prevailing whilst the reaction is taking place. Since it is customary in this country to make up relatively small batches, it is to be expected that there will be wide batch-to-batch variation in the actual resin produced. In addition, the finer process control necessary in finishes of this nature will result in further variation if the treatment is not carried out carefully.

The fabrics collected were examined under eight main headings—

1. Assessment of crease-recovery properties by measurement of creasing angles
2. Effect of added resin on crease-recovery, amounts of formaldehyde and nitrogen in the added resin, and reaction of formaldehyde with the cellulose
3. Free formaldehyde as evidence of effective washing after the treatment

4. Degree of fibre swelling in cuprammonium solution

5. Efficiency of processing as shown by resin distribution

6. Fastness to washing (i.e. launderability)

7. Fastness to light

8. Resistance to abrasion.

Results

The following is a summary of the results obtained; each series is discussed, and when possible some indication is given as to the factors which may have contributed to the cause of the variations found.

1. CREASE-RECOVERY ANGLES

About a dozen test methods have been suggested (mostly by American workers) for the evaluation of crease-recovery; however, only three of these have been used comparatively in this survey. No significant differences were found in the results obtained. The methods were—suspension over a silver wire, the mercury surface method, and an instrument designed by the British Cotton Industry Research Association and known as the "Shirley Crease-recovery and Stiffness Tester"⁷. The last was probably the easiest to manipulate. All the samples to be tested were allowed to condition, and the test was carried out under standard conditions of temperature and relative humidity.

Table I summarises the results obtained on the crease-recovery behaviour of all the fabrics under standard conditions of test, the first column giving the angles of creasing expressed as a percentage of 180° (i.e. of full recovery). It will be seen that a crease-resist-treated woven fabric rarely exceeds 90% crease-recovery when it has been creased and allowed to recover under standard test conditions. It is also clear that, when creases are made in either

TABLE I

Crease Recovery (%)	Percentage of Total Fabrics examined	
	Warp Crease	Weft Crease
100	1.2	1.6
95	11.2	4.8
90	20.0	22.4
85	19.6	22.8
80	25.2	22.8
75	7.2	8.4
70	7.2	8.0
65	2.8	4.0
60	3.6	4.0
55	1.6	1.2
50	0.4	0.0

warp or weft direction, there is no significant average difference between the two. This is in distinct contrast to the results obtained on individual tests, when the two frequently differ widely.

Since the results in Table I show the range as a whole and indicate that wide variations are found, it is of interest to examine the creasing behaviour of some of the more popular Utility fabrics⁸ produced by different firms. The examples given in Tables II-V illustrate the extent of the variation found and demonstrate how the resin treatment

has produced fabrics of different recovery properties. The results have been arranged to show the differences in diminishing order of crease-recovery.

TABLE II
Utility 1006 (Cotton-spun)

(1/32s cc* (1½ denier 1⅞ in.) 86 ends, 60 picks per inch in grey)

Crease Recovery (%)		Added Resin (%)
Warp	Weft	
83.5	80.0	13.2
78.0	77.0	11.1
77.0	77.0	10.2
72.0	70.0	12.4
70.5	72.0	12.4

TABLE III
Utility 1009 (Cotton-spun)

(1/18s cc (1½ denier 1⅞ in.) 64 ends, 60 picks per inch in grey)

Crease Recovery (%)		Added Resin (%)
Warp	Weft	
96.0	91.0	15.0
79.0	75.0	10.9
77.5	80.0	11.5
68.0	66.0	6.0

TABLE IV
Utility 1018 (Cotton-spun, Mixed Deniers)

(1/15s cc (50% 3 denier and 50% 1½ denier) 18, 12 54 ends, 48 picks per inch in grey)

Crease Recovery (%)		Added Resin (%)
Warp	Weft	
98.0	97.0	21.0
93.0	96.0	14.0
85.0	82.5	15.0
77.0	86.0	16.6
75.0	75.0	15.4

TABLE V
Utility 1023 (Flax-spun)

(1/25s linen lea (9.5s cc) (4½ denier 6 in.) 39 ends, 35 picks per inch in grey)

Crease Recovery (%)		Added Resin (%)
Warp	Weft	
91.0	91.0	13.8
89.0	90.0	10.0
84.0	84.0	15.5
81.0	81.0	14.3
75.0	75.0	12.8

It is obvious from the above that very wide variations exist even on the same quality of fabric, and it is further indicated that fabric structure differences in themselves are not sufficient to account for the irregularities shown in Table I. To some extent the results are surprising, since the whole process is one which lends itself readily to technical control and if carried out satisfactorily should at least produce uniform crease-recovery results on the same quality of fabric.

Further evidence of lack of uniformity may be seen when the amounts of added resin are examined (Tables II-V). In some cases they vary, in others they are very similar, yet the crease-recovery angles are widely different. For example, reference to Table IV shows that a good crease-recovery figure has been obtained by the use of 14.0% added resin but a poor result with 15.4%.

* Cotton count

It may be concluded from the above results that crease-resisted fabrics vary widely in their ability to recover, and that this is not entirely due to fabric construction; there are wide variations in the results which are due to processing variables.

Factors in Creasing

The crease-recovery properties of a fabric are determined partly by its construction, and it is to be expected that a certain amount of variation will be found between one quality and another. In addition to the influence of fabric construction, the physical properties of the fibre itself are of major importance in explaining the natural crease-resistance of silk and wool. The more crystalline, less cross-linked and oriented nature of the cellulosic fibres, such as cotton, linen, and the cellulose rayons, accounts for the poorer crease-resistance of these fibres compared with wool.

When carried out efficiently, application of a formaldehyde-type resin reduces the swelling properties of the cellulose fibre by cross-linkage of some of the hydroxyl groups, thus making the structure more readily able to recover when deformed.

It is, of course, well known to the consumer that humidity and temperature greatly influence the behaviour of a fabric when it is recovering from creasing. Marsh has discussed the effect on crease-recovery of relative humidity and fabric thickness⁹. In this latter connection, it is interesting to note that the thicker fabrics examined were more resistant to creasing, apparently because the yarns could not be folded so sharply as those from fine yarns.

The mechanism of creasing has been discussed at length by Kraus¹⁰, Hall¹¹, Marsh¹², Moncrieff¹³, Gruntfest and Cagliardi¹⁴, and many others, whilst the aspect of cross-linkage has been widely discussed by many workers, and the present state of the theory has been recently summarised by Cameron and Morton¹⁵.

Finally it should be recorded that quite frequently examples were found in which excessive amounts of starch and other hygroscopic agents had been added to the fabric, presumably in the finish; these additions, of course, are made to increase fabric weight and impart firmness of handle. They sometimes increase the tendency to crease, since the inherent springiness of the fibre is often affected.

The effect of the additional products in the impregnating bath has not been fully appreciated by finishers. The author has shown, in unpublished work, that a change from one softener to another is of sufficient importance to cause variation in the actual amount of added resin on a finished fabric. Frequently, softer-handling fabrics are wrongly attributed to benefits derived from the softener when in actual fact the softener has retarded the resin polymerisation. Differences can be even more obvious with addition of such fillers as china clay and the like. These factors can influence the handle and crease-recovery properties of a fabric.

2. RESIN CONTENT

An examination of the resin contents of fabrics of different qualities showed that on average the

heavier the type of fabric, the higher the resin content. Thus Utility 1006 showed an average resin content of 12.0%, and Utility 1018 and 1023 (heavier fabrics) 15.0%. The actual resin contents varied considerably from fabric to fabric even with those bearing the same brand mark. Two such fabrics (Utility 1006) had similar crease-recovery properties but the resin contents were 7.0% and 18.0%, there being nothing to indicate that these were intentionally different finishes although they were separate deliveries. Fabrics have on rare occasions been found containing 22.5% resin. In all cases of over 12.0% added resin, the increased amount appeared to be associated with attempts to produce a fabric having a firmer handle.

The variations mentioned above, as well as those quoted in Tables II-V, have made it impossible to associate the crease-recovery properties of a fabric with the actual amount of resin applied.

The methods used for resin estimation were carefully checked, and comparison was made of two methods in general use—

(i) Treatment of the sample for 1 hr. in 0.1 N. hydrochloric acid at 60°C., followed by thorough rinsing first in cold water and then in hot water, and drying to constant weight

(ii) Treatment in a solution of buffered acetic acid at 95–97°C. for 1 hr., followed by thorough rinsing in cold water and drying to constant weight⁶.

These two methods seem to give similar results (Table VI), but acid strength is of particular importance, since strong acid damages the fibre, resulting in additional loss in weight.

TABLE VI
Utility 1006 from Three Sources

		Added Resin (%)	
		Method (i)	Method (ii)
Fabric A	...	14.2	14.3
Fabric B	...	20.2	20.2
Fabric C	...	12.3	11.7

Experience has shown that the most reliable results are obtained when the estimations are carried out in duplicate on samples about 5 g. in weight, both cut from as near as possible to the centre of the fabric being tested.

Formaldehyde and Nitrogen Contents

The two methods were examined further by estimating nitrogen in the extract liquor (Table VII), to indicate the effectiveness of the acid stripping.

TABLE VII
Nitrogen in Resin Extract -
(% on original fabric)

Fabric	Method (i)		Method (ii)	
	Added Resin (%)	Nitrogen (%)	Added Resin (%)	Nitrogen (%)
Fibro-cotton	9.2	3.38	9.3	3.38
Utility 1018	23.7	6.01	23.2	5.87
Utility 1018	18.1	5.32	17.7	5.32
Utility 1018	10.0	3.81	11.8	3.71
Utility 1018	11.7	4.18	12.5	4.14

It was found that there was also a small percentage of nitrogen left on the samples after resin extraction (Table VIII).

TABLE VIII
Nitrogen remaining on Extracted Fabric
(Method (ii))

Fabric		Added Resin (%)	Nitrogen (%) on—	
			Original Fabric	Extracted Fabric
Utility 1006	...	11.4	3.28	0.14
Cotton-Fibro	...	9.2	2.93	0.12
Utility 1018	...	19.5	4.75	0.11
Utility 1018	...	16.9	4.13	0.09
Utility 1018	...	9.8	3.29	0.12

The effect on the same series of fabrics of the use of more strongly acid conditions, viz. 0.23 N. hydrochloric acid at 90°C., is shown in Table IX. The higher apparent resin loss is accounted for by loss of cellulose, as indicated by the acid-treated blank sample.

TABLE IX
Nitrogen remaining after Stronger Acid Extraction of Fabric

Fabric	Added Resin (%)	Nitrogen (%) on—	
		Original Fabric	Extracted Fabric
Blank Fibro (i.e. loss of cellulose)	1.17	—	—
Utility 1006 ...	13.0	3.28	0.04
Cotton-Fibro ...	11.5	2.93	0.06
Utility 1018 ...	22.7	4.75	0.03
Utility 1018 ...	18.9	4.13	Nil
Utility 1018 ...	12.7	3.29	0.16

These results show clearly that the acid treatments have not completely removed the resin from the fabric. It was frequently seen that a fabric with a high figure for added resin had a lower nitrogen content on the extracted fabric than those with a low added resin figure. This suggests that, when a greater quantity of resin is used, a smaller proportion is held within the fibre, which results in a decrease in resistance to subsequent washing. The loss will be further accentuated by differences in molecular size of the precondensate, particularly when highly precondensed resins are used, as in some proprietary products.

In an attempt to associate the amount of resin found on a fabric with its crease-recovery behaviour, the ratio of formaldehyde to nitrogen provided further evidence of the degree of process control used in resin preparation. Such estimations were carried out on about half the fabrics included in this survey, and a few of the results obtained are shown in Table X.

The results demonstrate again the inconsistent relationship of resin content to crease recovery, but they can be used to show that a finisher consistently uses standard amounts of formaldehyde and urea when making up the precondensate. It must be concluded, therefore, that the crease-recovery behaviour depends firstly on the fabric construction and secondly on the conditions of treatment. For, whilst a finisher may have exercised the greatest care in making up the resin itself, apparently too little attention is paid to the actual application,

TABLE X
Crease Recovery and Resin Composition
(% on original fabric)

Fabric	Added Resin (%)	H-CHO (%)	Nitrogen (%)	H-CHO Nitrogen	Resin Nitrogen	Crease Recovery (%)	
						Warp	Weft
Utility 1018	18.4	8.20	4.59	1.78	4.03	78.0	76.0
Utility 1018	14.6	6.74	4.13	1.63	3.55	83.0	82.0
Utility 1018	15.4	8.26	5.15	1.60	2.99	75.0	75.0
Utility 1023	11.5	6.52	4.12	1.58	2.81	83.0	77.0
Utility 1009	10.9	5.85	3.96	1.48	2.78	79.0	75.0
85% Fibro + 15% acetate rayon ...	13.7	6.67	4.68	1.43	2.95	94.5	94.5
80% Fibro + 20% cotton	11.6	3.86	5.46	1.43	2.13	88.0	90.0
Utility 1009	15.2	7.02	4.92	1.43	3.09	96.0	91.0
100% Fibro	12.8	5.74	3.92	1.43	3.26	94.0	85.0
50% Bright Fibro + 50% matt Fibro	11.5	5.29	3.61	1.42	3.19	83.0	83.0
74% Fibro + 26% acetate rayon ...	8.2	2.39	3.33	1.40	2.47	85.0	87.0
Utility 1006	12.3	6.16	4.42	1.39	2.79	88.0	88.0
100% Matt Fibro	10.8	4.00	5.53	1.38	1.95	77.0	74.5
Utility 1018	21.2	9.24	7.17	1.29	2.96	98.0	97.0

and it is probable that such variations as were found in crease-recovery behaviour on the same quality were the result of insufficient control, either at the padding mangle or during drying, baking, or the subsequent washing-off process.

Variation in the dilution between one lot of precondensate and another is a source of trouble, and it will result in different amounts of resin being added to the fabric; even so, the formaldehyde : nitrogen ratio will remain constant. The state of the fabric in relation to pick-up is a factor which is frequently overlooked, as is weight adjustment of the pad rollers, which can vary from day to day. Temperature increases whilst the fabric is being dried, particularly when a highly precondensed resin is used, can induce more rapid precipitation of resin than is desirable, and results in the formation of surface resin. In this condition the resin is rapidly removed during the final washing process. Similarly, temperature variation during polymerisation can result in a lower resin content than that actually applied, owing largely to the fact that (all other things being equal) each catalyst used may have its own critical baking temperature. Finally, increases in washing liquor temperatures (particularly when variations in drying and polymerisation have occurred) result in the breakdown of badly formed resin.

Thus the foregoing results, which have shown a variation in resin content coupled with differences in crease-recovery behaviour, lead to the conclusion that there has been insufficient control during the application of the resin rather than during the actual preparation of the precondensate used.

Action of Formaldehyde on the Cellulose

Reactions between formaldehyde and cellulose have, as stated earlier¹⁵, been frequently discussed by many workers.

The maximum amount of formaldehyde found on any of the 260 samples examined was 9.75%. This represents the amount which has reacted with nitrogen to form the resin, that which has reacted with the cellulose in methylenation, and any remaining as free, uncombined formaldehyde.

After repeated washing, the amount of formaldehyde was found to decrease progressively, and the loss appeared to be associated with the severity of the treatment. For example, on selected fabrics which had been laundered* 100 times about 0.7% total formaldehyde was found, and this amount was not reduced further by additional treatment in either boiling water or acid or alkali. The figure of 0.7% was usually found after the resin had been extracted in resin determinations from what was regarded as a well processed fabric. It was also observed that with amounts of the order of 0.28% formaldehyde on the fabric after extraction, the fibres would swell in cuprammonium but remained insoluble. In this connection, it is interesting to note that Dellenius¹⁷, who worked on acid formaldehyde treatments of cellulose, states that he obtained fibre swelling but not solubility with 0.11% combined formaldehyde. Armfield¹⁸ found the fibre to be swollen but not soluble with as little as 0.05% combined formaldehyde.

3. FREE FORMALDEHYDE

Free formaldehyde is that regarded as uncombined either as resin or with cellulose, and such excess is undesirable from a consumer viewpoint. It has an objectionable smell, it may cause skin irritation to the wearer of a treated garment, and it promotes the development of a fishy odour owing to the formation of methylamines, especially trimethylamine. It is essential that all resin-treated fabrics are adequately washed after polymerisation to remove excess uncombined formaldehyde.

Fabrics which are found to have more than 0.05% free formaldehyde are regarded as undesirable. The majority of the fabrics examined had below 0.025%. However, some were found to have as much as 0.09%, a few exceeded this latter amount, and one had over 0.2%.

It is also customary to associate the pH of the fabric extract in distilled water with free formaldehyde. The majority of such extracts were neutral, but some fabrics yielded pH 5.5, whilst others yielded pH 9.5.

In one outstanding case, a fabric, indicated as intended for use as a sports shirt, was noticed to

* S.D.C. No. 1 test¹⁹—30 min. at 40°C. in 0.2% soap soln.

smell strongly of formaldehyde, this becoming more pronounced on ironing. When tested it was found to have only 0.015% free formaldehyde, whilst the aqueous extract had pH 5.22. A cutting of the fabric was heated in a laboratory oven for 5 min. at 140°C. and washed off, the smell of formaldehyde then being indiscernible even during ironing. From this and a number of other tests it was concluded that the fabric had not been baked after drying, and that the formaldehyde resulted from the heating of unpolymerised precondensate.

Free formaldehyde on the fabric is due mainly to either insufficient polymerisation or lack of washing after treatment.

Whilst in this survey many samples were found to contain excessive free formaldehyde, the majority were very good. The worst examples were those which had not been baked, whilst quite a number had not been washed off after the treatment.

4. FIBRE BEHAVIOUR IN CUPRAMMONIUM SOLUTION

Insolubility of the treated fibres in cuprammonium solution is regarded as indicating that there has been cross-linkage between the formaldehyde or formaldehyde-urea complexes and the cellulose.

Although all the fabrics tested gave a positive urea-formaldehyde reaction, and the majority were insoluble in cuprammonium hydroxide, some were soluble. When treated in either hydrochloric acid or buffered acetic acid, many remained insoluble, but others became readily soluble. Those which remained insoluble after resin removal varied in degree of swelling; in some a number of the yarn fibres, usually under the crown of the yarn crimp, were found to be soluble. This may be regarded as indicative of poor penetration of the precondensate or of poor heat transfer during baking.

It was therefore concluded that, carried out as a single test, fibre swelling behaviour alone should not be used for the identification of resin treatment, but it can be stated that those fabrics where the fibres were insoluble were those which had the better wash fastness.

On the whole the test can be regarded as indicating cross-bonding, and if insolubility persists after resin removal the fabrics should give a satisfactory performance on washing.

5. RESIN DISTRIBUTION

The uniformity of distribution of the resin as applied was seen to vary considerably, being quite uniform in some cases and very irregular in others (e.g. Table XI). There were many examples which could be readily associated with uneven padding, and in such cases the difference could frequently be detected by a difference in handle from one part of the fabric to another. The latter three fabrics in

Table XI were obviously from the same source, and the differences were due to a variation in pad roller diameter or weighting.

The introduction of a staining technique proved of exceptional value during the survey, unevenness of stain indicating uneven distribution of the resin. This test is not recommended as a criterion of quality, it gives no indication of crease-recovery behaviour, nor can it be regarded as a test to prove whether or not the resin is inside or outside the fibre, as shown by Marsh¹⁹. However, it does demonstrate irregularity in resin distribution, which is often caused by uneven impregnation during padding or by migration which may occur during the drying or polymerisation processes.

In addition to the red azoic stain already published^{20, 21}, which restricted the use of the test to certain colours, two additional colours have been devised—blue and yellow.

To carry out the test, a sample of the dyed and finished crease-resisted fabric of any convenient size (preferably full width) is impregnated cold and then coupled by the standard technique used for azoics. This is followed by washing off, soaping, and a final wash off. The sample should then be pressed carefully in a dry cloth to remove the surplus moisture, and hung to dry in a drying chamber at 60–70°C. with a good air circulation to prevent migration.

RED STAIN

4.0% Brenthol AS (ICI) dissolved by the normal methods with caustic soda
20–30 min. cold
Washed off in a 2.0% soln. of common salt
Coupled with 20.0% Brentamine Fast Red 3GL Salt (ICI)
2.0% Soln. of common salt
20–30 min. cold
Washed off and soaped.

BLUE STAIN

4.0% Brenthol BN dissolved by the normal methods with caustic soda
40.0% Common salt (on wt. of material)
20–30 min. cold
Coupled direct with 20.0% Brentamine Fast Blue 2B Salt
2.0% Soln. of common salt
20–30 min. cold
Washed off and soaped.

YELLOW STAIN

5.0% Brenthol AT dissolved by the normal methods with caustic soda
60.0% Common salt (on wt. of material)
20–30 min. cold
Coupled direct with 20.0% Brentamine Fast Yellow GC Salt
2.0% Soln. of common salt
20–30 min. cold
Washed off and soaped.

TABLE XI

Distribution of Resin across Fabric Width

Fabric No.	Width (in.)	Added Resin (%) at—		
		Selvedge	Centre	Selvedge
1	54	8.9	15.4	—
2	36	15.4	—	16.9
3	36	15.3	—	17.9
4	36	15.8	—	17.5

The ratio of liquor to goods used throughout was 40 : 1. The Brenthol and salt were based on the weights of the samples. Soaping was carried out in 0.25% soap solution at 95°C. for 5 min.

The three stains can be useful in determining, in a qualitative manner, the distribution and location of the resin, and the test may be carried out

regardless of the original colour of most fabrics. By selection of the appropriate stain to provide sufficient contrast with the colour of the dyed fabric, each sample was examined by this technique. The unevenness in degree of staining produced on the greater number of samples was in the form of a duplex or two-sided effect (i.e. less staining on one side than on the other). This effect is due to non-uniform heating during drying, because the resin, which is non-substantive, will migrate to the hotter side of the fabric. Frequently this is a result of cylinder drying or an unbalanced air flow on the stenter.

In addition to drying faults, there were many fabrics which were insufficiently baked or had been subjected to low-temperature polymerisation. This can be demonstrated by use of the stain, since the depth of colour developed is in inverse ratio to the degree of polymerisation of the resin. It was possible to confirm this by subjecting the samples to a heat treatment at 140°C. for 5 min. in a laboratory oven; when retested and compared with the originals, the intensity of staining was markedly less on the rebaked samples. Fabrics which have been baked satisfactorily do not usually behave in this manner.

There was evidence of a good deal of resin migration on those fabrics which had been dried on a pin stenter after impregnation, in many cases largely due to the overfeed mechanism. Feeding on to the pins at a rate greater than the dry fabric is removed therefrom of necessity produces ripples close to the fabric selvedge; the ripples disappear with the subsequent alteration in fabric dimensions as drying proceeds, but the resin is seen to have migrated to the crests of the ripples during the earlier stages of drying.

It has been possible to demonstrate the ripple effect: A piece of white fabric was impregnated with catalysed urea-formaldehyde, and whilst the sample was still wet, it was fixed in an embroidery ring; drying was then carried out as uniformly as possible, and baking was done whilst the sample was still in the ring. The treated sample was then removed from the ring, soaped in the usual manner, and dried. This was followed by staining with the azoic red, as described above. The result (Fig. 1) clearly shows the area where the fabric was held tight across the ring, the resin being uniformly distributed. Migration of the resin has occurred from that portion of the cloth which has been totally enclosed in the ring (as indicated by the depth of staining). The wrinkles formed in the excessively creased fabric on the outside of the ring show the migration of resin to the crown of the crease. This is of the same form as the ripples produced on the stenter by the overfeed mechanism.

Stenter clips also cause migration of the resin. In this case it moves to the hot metal which is in direct contact with the fabric, because the rate of drying is increased in that area. This is well demonstrated by the image of clips themselves produced on applying the staining technique (Fig. 2).

When the staining test was applied to one of the commercial samples, a clearly formed hand imprint

was seen. This is an interesting example of resin migration. The darker portions of the imprint show the irregularity of resin distribution, while the lighter outline of the hand indicates the location of the migrated resin. It was possible to reproduce this effect by placing a wet hand on dry fabric between stentering and the baking process (Fig. 3).

The above examples indicate the sensitivity of the resin to heat and moisture gradients and serve to demonstrate that careful control is necessary. Obviously some of the faults may not be regarded as detrimental to a fabric, but the test can be of use in the detection of mechanical defects, particularly on new plants, and it has often served to identify them in such a manner that they could ultimately be corrected.

6. FASTNESS TO WASHING

It was not possible to assess the degree of improvement in wash fastness of colour which the crease-resist treatment had brought about, since comparable untreated samples were not available. However, generally speaking, the fabrics appeared to wash satisfactorily. It was observed that with one wash (S.D.C. No. 1*) no serious loss in depth occurred, though there were many changes in tone. With repeated washing, change in tone and loss in depth became more apparent after the fourth or fifth wash with a number of the fabrics tested. Some showed very marked patchiness after the first wash, but frequently the dyeing levelled up as washing proceeded.

Colour loss and dimensional change are, of course, criteria on which the consumer assesses fabric value. Some fabrics were found to have excellent wash fastness and showed no marked alteration in colour, even after fifty and in some cases a hundred repeated washings*, which may be regarded as a consumer life of three to four years. It is interesting to record that the repeatedly washed samples became very susceptible to changes in alkaline conditions after a time, the resin breaking down very quickly if small additions of sodium carbonate were made to the wash liquor.

In the majority of cases a progressive loss of resin was seen on the repeatedly washed samples, but there was no consistent loss, and it was concluded that this indicated a wide variation in the conditions under which the resin had been polymerised. Evidence of this became more apparent when the results of the staining tests were examined and the differences in cuprammonium swelling behaviour were seen. The fabrics with a poor wash fastness were always more heavily stained and were frequently greatly swollen, if not soluble, in cuprammonium solution.

The amount of resin added to the fabric did not influence the wash fastness providing it had been adequately polymerised. Thus it was not unusual to find a fabric with only 8-10% added resin which was quite fast to washing, and in one particular case a fabric having only 3% was found to give a satisfactory washing performance, whilst on the other hand some fabrics having 20% resin were not fast to washing.

* See footnote on p. 45.

The resin loss during a single washing under strictly comparable conditions varied considerably, some fabrics losing 5–20% of their total resin in one wash. Examples were found where the loss exceeded 25%, and in one case a fabric lost 80% of its resin on treatment in water only for 10 min. at 90°C.

The most unsatisfactory were a series of printed fabrics which lost almost all the added resin in one S.D.C. No. 1 wash (Table XII). They had not been baked or cleared after impregnation and drying; the poor wash fastness of the dyes used offered sufficient explanation as to why they had been put out to the retail trade in that condition.

TABLE XII
Wash Fastness of Poor Resin Treatment

Fabric	Added Resin (%)—	
	Original	After Washing
A	16.3	3.1
B	11.7	1.4
C	14.6	5.2
D	10.9	0.9

In almost every case there was shrinkage from the original dimensions. This was usually of the order of 5% in the warp direction, but the change varied considerably weftways.

It was concluded that serious loss of resin and change in depth of colour do not usually become apparent until about the fifth wash. Fabrics which were considered to have been well processed gave satisfactory washing performance, which should, of course, equal at least 25 washings to be reasonable from a consumer viewpoint.

It was obvious from the results that adequate polymerisation is the most important factor, the amount of resin added not being critical.

7. FASTNESS TO LIGHT

A selected number of the fabrics were exposed to daylight against the light-fastness standards (*B.S. 1006: Part 2*), under glass, at an angle of 45°, facing south. As the exact dyes were not known, similar colours were dyed with dyes of good light fastness, from the recommendations of dye manufacturers. Portions of the laboratory-dyed samples were then given a crease-resist treatment. In addition to these, a number of commercial ordinary-finish productions, from various sources, were also exposed. The exposures were made on the groups collected as under—

(A) Fabrics of commercial crease-resist productions, which were for the most part direct dyeings on plain fabric, but some were yarn-dyed (with direct, developed, or vat dyes) and some were spun-dyed mixtures

(B) Fabrics of commercial ordinary-finish production, which were direct dyeings on plain fabrics or were over-dyed on a ground containing spun-dyed black; some were developed dyeings

(C) Fabrics dyed with dyes recommended by manufacturer X as suitable for crease-resist treatment, exposed both (i) before and (ii) after crease-resist treatment

(D) Fabrics dyed with dyes recommended by manufacturer Y as suitable for crease-resist treatment, exposed both (i) before and (ii) after crease-resist treatment

The dyes used were strictly for comparison; they consisted of self shades and mixtures dyed in direct or developed dyeings. They were all selected

types which were reputed to show little change in light fastness when subjected to crease-resist treatment. In addition, they were selected as dyes in common use. Exposures were examined, and grouped as in Table XIII.

TABLE XIII
Light Fastness of Crease-resisted Fabrics
(Percentage of exposures)

Group ... Grade	A	B	C		D	
			(i)	(ii)	(i)	(ii)
1 ...	1.0	0.0	0.0	0.0	0.0	0.0
2 ...	0.0	0.0	0.0	0.0	0.0	0.0
3 ...	42.0	32.0	19.0	25.0	15.0	26.0
4 ...	10.0	40.0	12.0	19.0	26.0	15.0
5 ...	23.0	20.0	19.0	19.0	29.5	26.0
6 ...	11.5	8.0	44.0	25.0	29.5	29.5
>6 ...	12.5	0.0	6.0	12.0	0.0	3.5

Of the commercial crease-resist productions (Group A), 50% had a light fastness of 3 and 4, 23% of grade 5, and only with about 24%—when spun-dyed, or when vat or certain developed dyes had been used—did the fastness exceed 5.

The commercial ordinary-finish productions (B) had 72% with light fastness of 3 and 4, 20% of grade 5, and only 8% were in grade 6.

The light fastness of fabrics dyed in accordance with the dyemakers' recommendations (C and D) was better than that found in commercial productions of crease-resist fabrics.

The results show that the light fastness of commercial crease-resist productions is generally 3 to 4, with some of fastness 5, and some 6 or greater; whilst the ordinary-finish fabrics had the greatest number in grade 4, but there were some in grades 5 and 6.

Those samples dyed with known, recommended dyes indicate a reduction in light fastness after crease-resist treatment. The results, however, are better than those of the commercial samples examined, and they must be taken to indicate the necessity for careful selection of dyes. They show that, if the recommendations of dyemakers were carried out, a general improvement in light fastness would result.

8. RESISTANCE TO ABRASION

Resistance to abrasion has not been examined over the full range of fabrics collected, since untreated comparisons were not available. Such as were tested showed considerable differences in resistance to rubbing with the same quality, and no conclusive results were obtained. One thing was obvious—that fabrics with a pronounced duplex effect (due to resin migration) showed variation in different parts of the fabric.

Discussion of Results

The object of this survey was to study the variability in quality of crease-resist finishes supplied to the consumer. Wide variations have been found, not only in those fabrics which, because of their construction, could be expected to vary one from another, but even on the standard Utility qualities, which may have been processed by any one of the many crease-resist finishers. The variations were such that they could lead to

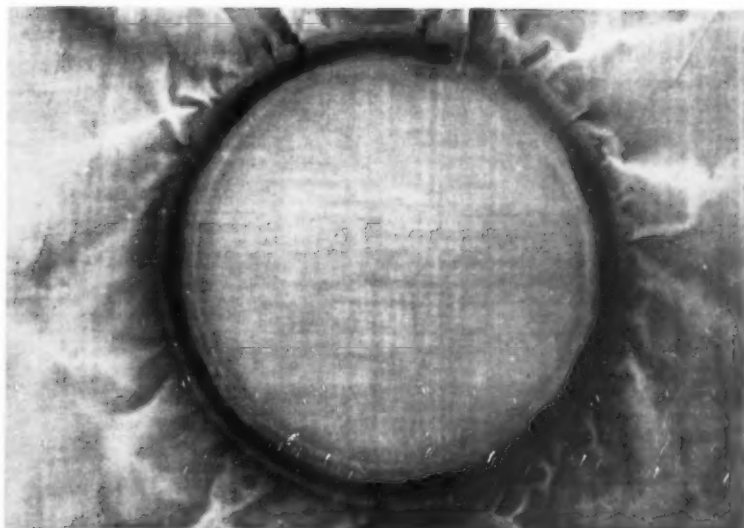


FIG. 1

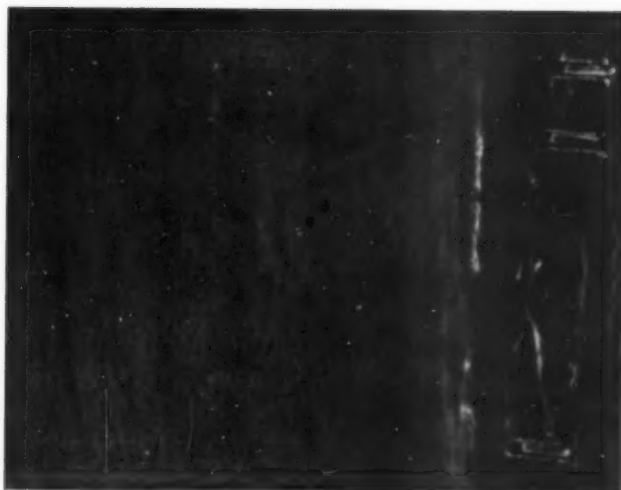


FIG. 2

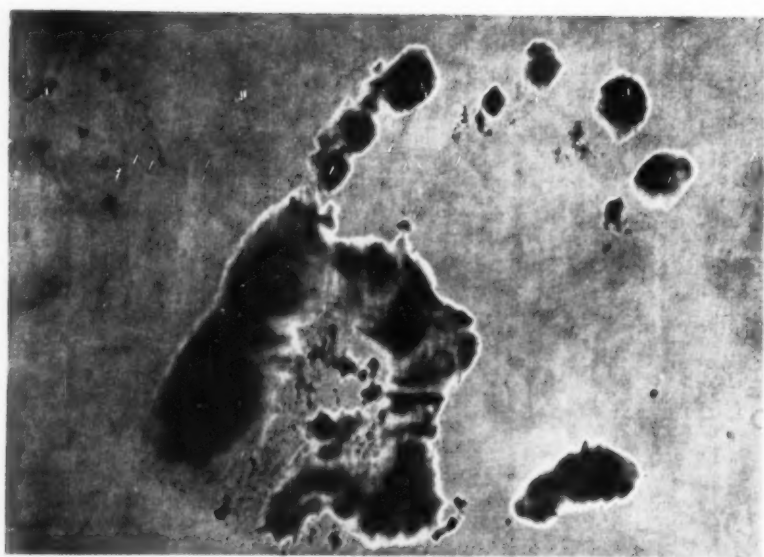


FIG. 3

justifiable consumer complaint, since improved crease-recovery behaviour over the original is the object of the process.

The effect of resin content on crease recovery has provided no clear picture, since it has been impossible to show that there is any relationship between the two. The estimation of nitrogen in extract liquors and on acid-treated fabrics indicates that even severe acid treatments do not completely remove the resin from the fabric when the former has been adequately polymerised.

The amount of free formaldehyde found on the fabrics could be regarded as satisfactory in most cases, but there were a few very bad examples.

Observations on cuprammonium swelling behaviour reveal that, whilst it does indicate that one fabric may be of better wash fastness than another, it is by no means a reliable guide to fabric behaviour, particularly in the direction of crease-recovery properties.

The resin applied to the fabric is frequently seen to be uneven, owing to mechanical defects in plant, largely in the drying process. Many attempts had obviously been made to polymerise on the stenter, and results have been very poor, particularly when the older-type stenters had been used. Examples were found of resin migration to the centre of the fabric where fish-tail heat distributors had been used.

Fastness to washing was on the whole quite good where the resin had been satisfactorily applied. The worst examples were a number of prints.

Light fastness was generally satisfactory, but it could have been improved by better selection of dyes.

The assessment of abrasion resistance was totally unsatisfactory, no reliable results being obtained.

In addition to those fabrics which have been discussed in the survey, others such as crease-resisted cotton, linen, and some viscose rayon knitted fabrics were examined. The fabrics made from cotton and linen had poor crease-recovery properties, many having only 50–60% recovery. The cotton fabrics had usually about 7.0% added resin, and there were wider variations on linen. The knitted fabrics were found to recover fully, but had only about 7.0% added resin.

Those fabrics which had been obtained from other countries were very similar under all conditions of test to those produced in the British Isles, and it was concluded that the factors which produce variable results are characteristic of the processes themselves.

It is felt that some of the factors which influence the results generally are unknown or they may even be beyond the limits of present-day control. Possibly the process is far more sensitive than is fully appreciated, and it is certain that there is ample scope for fundamental research on the amount of resin necessary to produce a specific result in crease-recovery behaviour.

Some of the darker shades, particularly browns and reds, were harsher in handle than were the paler shades, and frequently they had a lower crease-recovery figure than the same quality in

other shades. A possible explanation is that dark direct dyeings are frequently salt-washed after dyeing. The introduction of salt carried forward by the fabric to the precondensate bath could cause rapid precipitation of resin, making fabric penetration difficult.

Examples were also found which, having been in stock for some time, showed clear indications of resin migration in the rig mark (i.e. toward the edges). This could indicate insufficient polymerisation, but more probably an additional factor—that a urea-formaldehyde resin is never completely stable under certain conditions of storage.

In all the work not one example of overbaking was found, the general tendency being inadequate baking. Presumably this is done to preserve fabric strength, for there was no sign of weakness which could be attributed to excessive heat.

Conclusions

The results obtained during the survey have shown that the crease-resisted fabrics which are supplied to the retail trade vary widely in their performance. Generally speaking, however, it was clear that excellent results could and were being obtained; but many processing defects were revealed which could have been prevented.

Chemical analysis of the fabrics has led to the conclusion that the variations are largely due to lack of adequate technical control, not so much, however, in the actual preparation of the resin, as might have been expected, as in its general application to the fabric. It has been shown that each finisher is fairly consistent in the formaldehyde:urea ratio used but not consistent in the amount of resin added to the fabric.

It may be assumed that variations of this nature are not always intentional, since fabrics of the same quality, from the same source, often vary widely.

The actual amount of resin added to the fabric does not appear to bear any relationship to the crease-recovery behaviour of a particular fabric, for some having a low resistance to creasing had a reasonable amount of resin, whilst others with either high or low resin figures had produced a high degree of crease recovery.

* * *

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The Dyeing and Finishing of Warp-knitted Fabrics made from Regenerated and Synthetic Fibres

J. BROMLEY and A. G. CHEEK

Meeting of the London Section held in the rooms of the Royal Society, Burlington House, Piccadilly, London, on 2nd February 1951, Mr. G. Wood in the chair

As the title suggests, this paper is essentially a record of practical experience in one branch of dyeing and finishing, intended especially for the practical dyer. It is, in fact, a summary of many years' experience in the bulk production of warp-knitted goods. At the same time, it is hoped to demonstrate the extensive and varied possibilities of warp-knitted fabrics. Many people connect warp knitting with the production of locknit-type material, and have little idea of the very wide range of fabrics produced on knitting machines, ranging from light-weight lingerie and nightwear to dress and coat materials and heavy furnishing fabrics.

Consideration or description of warp-knitting machines is beyond the scope of this paper. Of course, in his own interest the dyer should know the principles of warp-knitting and the fact that there are different types of machines producing goods of varying characteristics, but this information should come from a knitting technician. We shall therefore mention only that there are three main types of machine—locknit machines, including the Saupé and the newer F.N.F. machines, milanese-type machines, and, of smaller importance, the Raschel machine. These machines have the common feature that the yarn used is in the form of warps, but they vary considerably in form, arrangement of the warp, and actual mechanism.

In recent years, the developments in warp-knitting machines have been considerable, and the most modern high-speed machine, viz. the latest F.N.F., will knit some 1000 loops per minute, the fabric production per minute being many times that of the most modern automatic loom. No-one would seriously suggest that there is a danger of warp-knitted goods supplanting woven goods, but it would seem that there will be considerable expansion in the production of warp-knitted fabrics, and that increasing quantities may be expected by dyers and finishers.

Knitted fabrics have their own characteristics and peculiarities, and the dyer will obtain the best results by keeping these in mind. For successful production, i.e. quality with economy, the processing technique must be adapted to serve the needs

of the fabric rather than the fabric made to fit some existing routine.

One of the most important properties of warp-knitted fabrics is their very flexible construction, which is of considerable value for certain garments, but due allowance must be made for this property in processing. The popularity and success of rayon knitted goods are due in some respects to the pliability and consequent suitability for knitting of rayon yarns. Some fabrics, e.g. locknit for underwear, are not dimensionally stable, and in many cases exhibit considerable extension in length and contraction in width during processing; on the other hand, many fabrics are produced which do not exhibit this high degree of stretching.

A second characteristic of many knitted goods is the tendency of the selvedge to curl. This presents no major difficulty if the precautions outlined later are observed.

Knitted goods, unlike woven goods, do not usually contain objectionable sizes. To impart pliability to the yarn during knitting and reduce friction by lubrication, oils are applied, consisting e.g. of white paraffin oils in suitable solvents. For the most part, these are easy and simple to remove during scouring, as they should be. In addition, of course, will be found the dirt and oil-stains attendant on all textile processing.

It is proposed now to give examples of the processing of different types of knitted goods, with details of the machinery employed. These are not ideal or theoretical processes, but examples of methods arrived at as the result of many years' experience.

ACETATE RAYON FABRICS

Seraceta (Bright Acetate Rayon) Locknit

This very popular fabric is produced in large quantities for underwear and nightwear. (It is intended to give the treatment of this fabric in some detail, as a basically similar technique is employed for other fabrics.) According to some authorities this fabric should arrive at the dyers' on cardboard tubes, free from creases and dirt. In practice it tends to arrive in untidy bundles with the selvedges already beginning to curl. After the

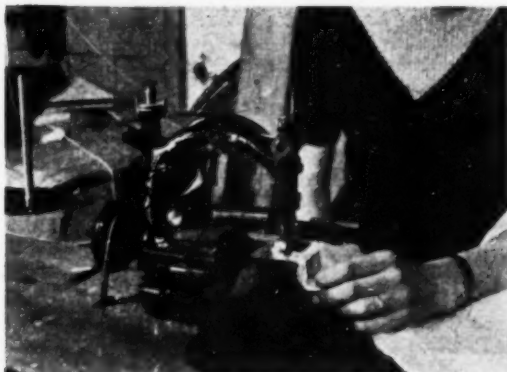


FIG. 1—Selvedge-sewing Machine

customary inspection, sorting, and marking, the individual pieces of length 50–55 yd. are folded selvedge to selvedge, with, of course, all the face side inside or outside as preferred. The two selvedges are stitched together to prevent curling. A chain stitch of 5 stitches per inch, using No. 16 cotton, is very suitable for 60-denier acetate rayon

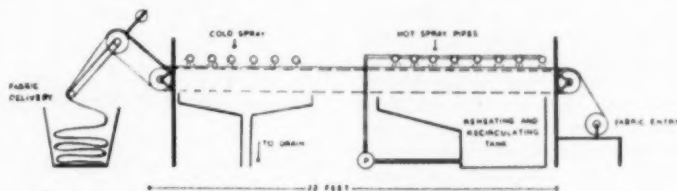


FIG. 2—Contracting Machine

fabric. A suitable machine is the Wilcox and Gibbs (Fig. 1), and the stitching is a simple process, but it requires care. The fabric stretches lengthways very easily, and because of careless handling it is possible to complete the stitching and find that one selvedge has been pulled more than the other, with as much as a yard of distortion. It has been recommended that the selvedges be marked at regular intervals with a fugitive tint to avoid this distortion. The stitching must not be tight, as the material will extend in processing as much as 20%, and the cotton stitching must be capable of adapting itself to this extension. It is also important that the stitching should be continuous, as any breakdown in the stitching, although not particularly troublesome in scouring and dyeing, will inevitably mean refinishing of the pieces; the reason will be readily appreciated when the drying and finishing machine is described later (p. 55).

The fabric, now in tubular form, is ready for the first wet treatment, that of *contracting*: the locknit, while flat, free from creases, and relatively free from tension, is treated with a liquor at a temperature (80°C.) higher than will be used in subsequent processing. This is a form of presetting, offering some insurance against development of creases and cracks, and is especially valuable with heavier fabrics.

One form of machine that can be used for this treatment consists of a linen conveyor belt supported by wooden poles which are fastened to two parallel endless chains (Fig. 2). The fabric is fed on to one end of the machine and passes under a succession of ten spray-pipes, which saturate it with a solution of 0.1% soap and 0.1% Calgon T (Albright & Wilson) at 80°C. for bright acetate rayon. A tank under the belt collects the liquor for reheating and acts as a reservoir for the sprays. After the hot treatment come five sprays of cold water to cool the fabric, which is then collected in wagons. To obtain continuity, the pieces in tubular form are linked together by inserting between the pieces a large steel needle, which can be inserted and removed very quickly and easily. A suitable speed is 25 yd./min. The purpose of cooling the material before piling is to prevent the formation of creases, which can occur if hot goods are piled.

After contracting, the pieces are ready for scouring and dyeing, for which purpose a winch is used (Fig. 3). The size of winch machine used is approx. 16 ft. × 7 ft. × 2 ft. 4 in., and its working capacity 900 gal. This will accommodate 30 pieces of 55 yd. length, varying in weight from 400 to 800 lb., giving a liquor : cloth ratio of approx. 20–10 : 1.

The pieces are entered individually, and each piece is stitched to form an endless rope with as little twist as possible. The winch is approximately two-thirds full of cold softened water, and when the pieces are running smoothly, 0.1% soap and 0.1% ammonia (sp. gr. 0.900) on liquor volume are added and the temperature is raised to 60°C.

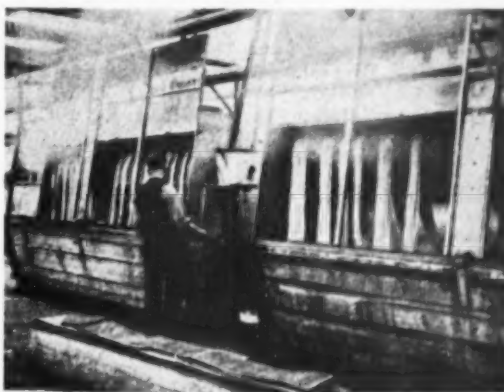


FIG. 3—Winch

At this point, it may be advantageous to comment on optimum dyeing temperatures for bright acetate rayon goods. It is well known that delustring of acetate rayon in normal scouring does not occur below approx. 80°C. This is true, but it is dangerous to assume that it is therefore safe to process up to 80°C. Acetate rayon fabric is a relatively plastic material, and the higher the temperature of processing, the greater the danger of developing crease and crack marks. A simple experiment can be made of dyeing an acetate rayon material at temperatures ranging from 50° to 85°C. and comparing the resultant pieces for smoothness of finish. This will show the value of using a temperature well below 80°C.

We have found it advantageous to scour and dye bright acetate rayon locknit fabric at a temperature not exceeding 60°C. Scouring is usually completed in 30 min., the liquor is then run off, and the winch filled with cold water ready for dyeing, it not being necessary to rinse between scouring and dyeing, as the dye liquor and scouring liquor are of similar composition.

With this class of material it is our experience that the shades customarily required are standard shades—mostly pastels, with smaller quantities of black and navy. This, from the dyer's point of view, is very helpful, as once he has selected a range of dyes providing the required fastness (Table I) and has carefully matched the shades, very little trouble is experienced in matching problems in the dyehouse. Thus the disperse dyes are carefully weighed out, suitably dispersed, and sieved into the dyebath, set with 0.03% soap and 0.05% ammonia (on volume), the winch being run for 10 min. in the cold to ensure adequate circulation and the temperature then raised to 55–60°C. and maintained thereat for 3 hr. To some, this time may seem rather excessive, but we find after many years of production that it is most satisfactory when account is taken of the almost negligible quantities of "retreatments" for patchy and unlevel dyeing. In the majority of cases, with standard shades no further additions of dye are required. At this stage, 0.05% Calgon T is added, and the goods are run for a further 10 min., in order to prevent the formation of a scum which may occur when the goods are rinsed in cold water.

TABLE I
Typical Dyes suitable for Warp-knitted
Acetate Rayon Fabrics

Duranol Brilliant Yellow 6G (ICI)
Serisol Yellow N (YDC)
Supracet Brilliant Red 2B (LBH)
Setacyl Direct Red BN (Gy)
Serisol Fast Scarlet BD (YDC)
Dispersol Fast Crimson B (ICI)
Cibacet Violet B (Ciba)
Duranol Brilliant Violet BN (ICI)
Supracet Brilliant Violet 2R (LBH)
Serisol Brilliant Blue BG (YDC)
Duranol Blue Green B (ICI)
Duranol Navy Blue BR (ICI)
Duranol Brown BN (ICI)
Serisol Diazo Black B (YDC)
Acetoquinone Black NRM (Fran)

Two rinses are usually sufficient, each of about 10 min. duration.

As dyeing takes place at 50–60°C. the disperse dyes are selected from those that exhaust and level well at this temperature. It is recommended that, for pale blues and mixture dyeings containing blue, a suitable inhibitor be added to the dyebath to prevent fading due to burnt gas fumes.

The ends of the pieces are unstitched and the pieces are removed from the winch by passing 15 ends at a time over hand-operated winch wheels (Fig. 4A and B), the material passing into cotton bags ready for hydroextracting.

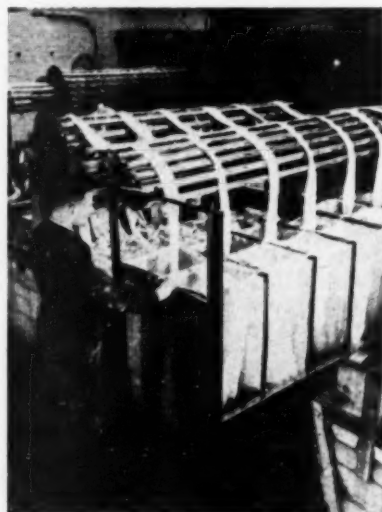
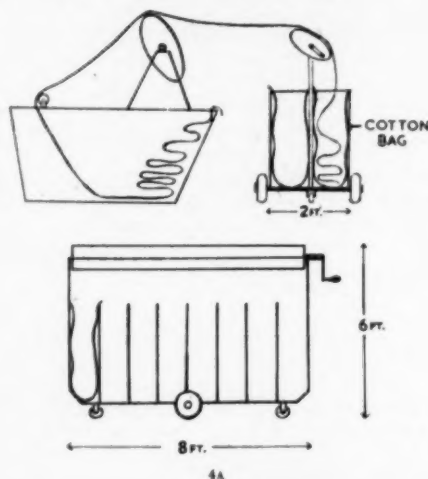


FIG. 4A and 4B—Hand Winch for removing Fabric from Dye Winch

Blacks are obtained by dyeing with diazo components and coupling with 3:2-hydroxynaphthoic acid. Drying and finishing of fabric in tubular form will be considered later (p. 54).

Opaceta (Pigment-dulled Acetate Rayon) Locknit

This fabric is processed in a similar manner. After dyeing, it has been found advantageous to add to the final rinse-water 0.01% soap (on volume) to act as a finish and facilitate removal of the fabric by virtue of its lubricating effect.

Bright Acetate Rayon Glove Fabric

This material requires dulling in the piece form. The method employed is to stitch in tubular form as before, and then wind on special frames (Fig. 5).

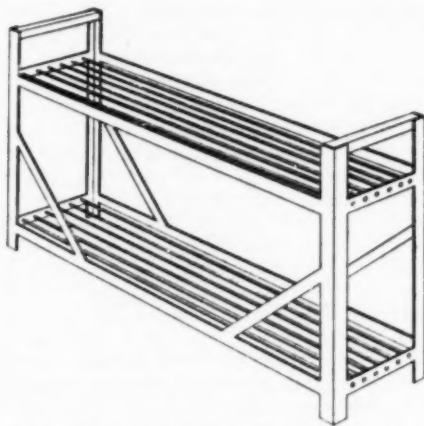


FIG. 5—Stainless Steel Frame for Dulling (diagrammatic)

This is accomplished by lacing the first stainless steel rod, $\frac{1}{4}$ in. in diameter, through the end of the piece of fabric, and then fixing it in the first two holes at either side at the bottom of the frame. The stainless steel rods at the top of the frame, which number 24, are a fixture and are about 1 in. apart. Working from the first bottom rod, the fabric is then drawn up and down over the top rods, and further rods are threaded through the holes provided at the bottom of the frame. In this way the fabric is formed into loops over the top rods and under the bottom ones, and is thus held in position while in the dulling bath. The top of the frame is adjustable so as to take up any slack, which is often necessary. The end of each piece is secured in the same way as for starting, i.e. by lacing the rod through the end of the fabric and securing the rod to the frame. The bottom rods are then made secure by a simple locking device over all the ends.

These frames are suspended in rectangular wooden tanks, of capacity 500 gal., with a false bottom, under which is a closed steam coil. Each tank holds five frames, wound with ten pieces. The liquor is a boiling solution of 2% soap and 0.25% cresylic acid. After 2 hr. treatment, during which the frames are moved up and down every 15 min., a small piece is removed, dried, and compared with a standard dulled pattern. This length of time is usually sufficient, and the frames are then removed from the dulling bath and washed, first in warm water, and then in cold water. The dulling bath is retained, and after testing for soap and cresol content, strengthened by additions and reused. Up

to 10 batches (i.e. 100 pieces) can be treated in the same dulling bath if tested in the manner described in Appendix I.

After dulling and washing off, the bottom rods are removed from the frames, and the fabric is laid up in folds by hand on to a barrow. It is then entered into a winch containing 0.025% Calgon T at 30°C.; 0.125% soap is then added, and the temperature raised to 55°C. for 30 min. The material is then rinsed in warm water for 15 min. at 50°C., and subsequently dyed as before.

With this fabric a flat (i.e. not tubular) finish is required; the chain-stitching is removed at this stage, and the pieces are opened out by hand and placed on a barrow. It is extremely important when opening and later stitching the pieces together that they are all the same way, i.e. all face upwards or all face downwards, as the uncurling device on the stenter can deal only with pieces in which the selvages all curl the same way. These are then stitched together in suitable quantities (say 10 pieces) with end-cloths, and threaded under and over a series of wooden or metal rails prior to running on to a wooden block.

The "running-up" machine consists of a series of wood or metal tension rolls about 3 in. in diameter, four of which are fixed and one free. The drive of the machine is connected to a square tapered metal boss, which fits into a brass cap at one end of the wooden block. The other end of the block is supported with a similar square metal boss which runs free.

The wooden block is round, 6 in. in diameter and approx. 66 in. long. Each end is reinforced with brass caps, in the centre of which are square holes about $\frac{1}{4}$ in. smaller than the large end of the tapered metal bosses into which the ends of the roll are fixed.

The wooden block is rotated by means of an electric drive, and the fabric wound round the block to form a roll. By passing the damp fabric over and under the tension rolls before winding on to the wooden block, the width is reduced from about 56 in. to 42 in. This ensures that the finished fabric fulfils the requirement for gloves; i.e. it stretches readily one way, but is stable lengthways.

The fabric is subsequently dried on a pin stenter with no overfeed. The decurling device fitted to the stenter must be used to ensure close pinning to the selvage; hence the necessity of having the fabric stitched with the selvage curl all one way.

VISCOSE RAYON FABRICS

Bright and Matt Viscose Rayon Locknit Fabrics

Lighter fabrics are entered straight into the winch and the ends tied. It is found advantageous to "precontract" heavier fabrics (over 5 oz./yd.) with boiling water on the machines already described.

Excellent results are obtained by the use of an "expander" fitted inside the fabric, which has been stitched selvage to selvage (Fig. 6). This consists of a curved metal bar, the two ends being joined by straight metal pieces which fit into a cylinder containing a spring. When inside the material, the spring forces out the ends of the curved bar, thus

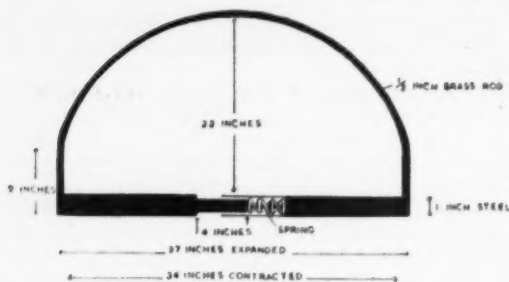


FIG. 6—Expander

removing creases. When used in conjunction with the linen conveyor belt, the expander is positioned in front of, and held back by, a light mangle, the upper roller working in a slot to permit seams to pass. The contracted material is then entered into the winch and stitched as described previously. Scouring consists in treating for 30 min. at the boil in 0.125% soap and 0.1% sodium carbonate (on volume), washing off in two hot washes for 10 min. at 50°C., and then cooling down with cold water.

The fabric is dyed with direct dyes. For lingerie shades the dye is accurately weighed, carefully dissolved, and added to the cold dye bath containing 0.03% soap (on volume). The winch is run for 10 min. in the cold, and the temperature gradually raised to the boil, and continued at the boil for 1 hr. The temperature is then dropped to 80°C., and dyeing continued for a further 30 min. Provided the shade is satisfactory, the material is then rinsed twice for 10 min. in cold water and removed over hand winches as described previously. It will be noticed that no salt is added, as this is unnecessary for pale lingerie shades. Using softened Boeking water there is an appreciable amount of electrolyte present, sufficient for salting on pastel shades. The dyes are selected to give reasonable fastness to mild washing, and as such are not the best-levelling types; the omission of added salt and careful temperature control permit level dyeing. Medium and dark shades are dyed with the customary additions of salt.

Bright Viscose Rayon Milanese Fabric

This is a popular and valued material, and to obtain the best results requires great care in handling. It is stitched in tubular form, pre-contracted with a boiling solution of 0.1% soap and 0.1% Calgon T, and entered into the winch, the ends then being stitched. A more rigorous scour is required for this material than for the acetate rayon, and this consists in treating in a bath containing (on volume)—

- 0.125% Soap
- 0.25% Solvent naphtha emulsion
- 0.35% Caustic soda (70° Tw.)

The process is started cold, raised to the boil, and kept at the boil for 1 hr.; this is followed by two hot rinses at 50°C. for 10 min. This material is prone to show dark stains from the knitting needles, requiring an acid treatment in a bath containing (on volume)—

- 0.125% Hydrochloric acid (sp. gr. 1.16)
- 0.1% Oxalic acid crystals

for 1 hr. at 85°C. (the high temperature of the acid treatment is necessary to remove the stains completely).

This treatment is followed when necessary by bleaching in sodium hypochlorite (0.25 g. available chlorine per litre) for 30 min. at room temperature and pH 4.5. Sodium metabisulphite is then added to the bath as an antichlor treatment. Two rinses are given for 10 min. at 50°C., followed by one in cold water.

Dyeing procedure is as before. This material is softened in a winch containing (on volume)—

- 0.175% Sulphonated arachis oil
- 0.2% Formic acid

at 20°C. for 15 min., and removed without rinsing.

Choice of dyes is governed by many factors, not the least of which is the personal preference of each dyer. Thus, although, for instance, the use of disperse dyes has been mentioned for acetate rayon, another dyer may use the soluble acetate rayon dyes, get good results, and be convinced that his is the better choice. With the viscose rayon fabrics with which we have been dealing, it must be admitted that light fastness has not been a very exacting requirement. Dyes have, therefore, been selected for fastness to mild washing as far as practicable. With some qualities it is necessary to use level-dyeing (Class A) dyes. Selected direct dyes of all classes, specially suited to this trade, are listed in Table II.

TABLE II

Typical Direct Dyes suitable for Warp-knitted Viscose Rayon Fabrics

Chlorantine Fast Yellow 4GLL (CAC)
Chlorazol Orange POS (ICI)
Direct Fast Orange SE (CAC)
Chlorazol Fast Scarlet 4BS (ICI)
Durazol Red 6BS (ICI)
Chlorazol Fast Helio 2RKS (ICI)
Durazol Helio BS (ICI)
Diphenyl Fast Bordeaux B conc. (Gy)
Rosanthere Fast Bordeaux 2BL (CAC)
Rosanthere Violet 5R (CAC)
Durazol Blue 4RS (ICI)
Diphenyl Fast Blue 4GL (Gy)
Solar Brilliant Blue 2BF (S)
Trisulfon Blue FOW (S)
Rigan Sky Blue G (CAC)
Diazo Indigo Blue BR (CAC)
Direct Green 2G conc. (CAC)
Chlorantine Fast Green 5GLL (CAC)
Benzanil Brown B (YDC)
Paramine Hosiery Brown RG (LBH)
Diphenyl Brown FY (Gy)
Carbide Black E (CAC)
Visco Black NFA (Fran)
Durazol Grey RGS (ICI)
Chlorazol Black BH (ICI)

The locknit processed in tubular form (with the exception of glove fabric) is dried and finished in this form on the well known Pegg machine (Fig. 7 and 8). At the delivery end of the machine are two steel rollers, and two smaller rollers to take the endless blanket. Below this are a stretching frame and a set of five Staybrite rings. The blanket can be guided by a hand manipulation, and a device at

the side of the machine can be used to adjust the nip of the bowls, which can be either felt-covered or bare, hot or cold. Our experience is that better results are obtained by using felt-covered rolls, as a less polished appearance results. The effect of increasing the nip pressure is to give a flatter finish.



FIG. 7

Fabric from the dyehouse is stored near, but not beneath, the dryer, preferably under conditions which do not permit the outside of the load to dry in the atmosphere. A length of fabric is loaded on to a cartridge at the base of the machine, which is then fixed to the machine by a locking device, and when in position hot air is blown from the inside through a perforated tube. The fabric is pulled up by the rolls at the top of the machine, the speed being governed by the type of fabric. The hot air gradually dries the fabric, but this should not be too dry before reaching the set of rings. The size of these rings determines the yield, and to some extent the width, of the material. After passing the rings, the fabric passes to the stretcher, which sets the width of the material, and then through the bowls, where the desired finish is obtained.

Each machine has two cart-ridges, so that while one is in use a second can be loaded ready to replace the first. Such a machine dries and finishes light acetate rayon at 14-15, light viscose and heavy acetate rayon at approx. 10, and heavy viscose rayon fabrics at 5-7 yards per minute.

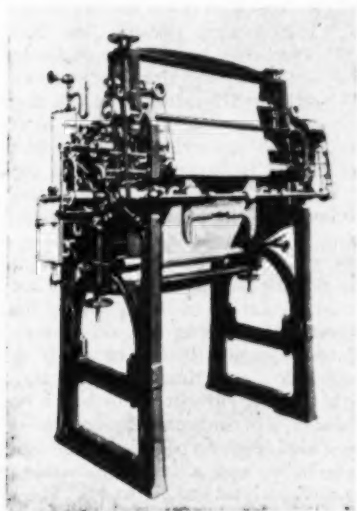


FIG. 8

The material is under little strain during this drying and finishing, a decided advantage with rayon goods. Another characteristic of the finish — the "loft" — is due to the fact that the hot air blows through the loosely held fabric and tends to separate the filaments; much of the beauty of the Pegg finish is due to this.

Material finished on the Pegg machine is despatched to the customer rolled on cardboard tubes still in the stitched tubular form. The material when opened out will obviously show a centre crease. When an opened form is demanded, the pieces are opened out in the wet state, i.e. as described for the glove fabric, and then dried on the stenter to the correct width. All material for printing will obviously require treating in this manner.

In addition to the types considered, there are the numerous possibilities of mixed yarns of Seraceta, Opaceta, Delustra, and bright viscose rayon. In the main, such blends present no new difficulties, with the proviso that for cross-dye effects care is taken in choice of dyes.

Fibro (viscose rayon staple) knitted fabrics are suitable for men's underwear and sports shirts. These are often produced in a mesh-type knit. No setting treatment is effective with these materials, and they are scoured and dyed in the winch without preliminaries. Heavier fabrics of Fibro are not suitable for treatment in a winch because of the formation of creases, and with some of these it has been necessary to scour and dye on the jigger, relying on expander bars to prevent selvedge curling. Material processed on the jigger is normally dried and finished on the stenter.

Knitted goods are suitable for giving a raised finish, which is popular for gloves, children's wear, dressing gowns, etc. An orthodox raising machine is employed, the degree of raising depending on the number of passages through the machine or machines, the fibres used, and the construction and end-use of the fabric.

Application of an anti-crease finish to warp-knitted rayon fabrics has never been as important as with woven goods, and in fact with some knitted fabrics the results can only be described as disappointing. It is probable that much less work has been done on the anti-creasing of knitted than of woven goods.

Dimensional instability of some knitted goods is more a feature of the fabric construction than of the yarn properties, and in this case little improvement results from the application of an anti-shrink finish of the acid-formaldehyde type.

NYLON FABRICS

Warp-knitted nylon fabrics have been an instant success, the strength and pliability of the nylon lending itself to the production of light-weight fabrics whose filmy lace-like structure belies their strength and durability. The range of nylon fabrics is extensive; particular attention will be paid here to nylon locknit and nylon diamond-mesh fabric.

The first decision the dyer and finisher must make is when and how he will set the nylon, and

this will be influenced by the type of setting equipment available. For adequate setting, the choice at the moment lies between the use of steam and dry heat. It is true that some degree of set may be obtained by using boiling water, but this cannot be considered adequate.

The two methods, dry heat and steam, are not, strictly speaking, alternatives, as they give different handles to the material. The finish obtained by heat setting is flatter, more lustrous and sheer in appearance than a steam-set fabric. The latter method gives a fuller and more compact handle. Some of the differences may be due to the fact that there is a tendency to obtain less shrinkage by the heat-setting process. Both types of finish will be required, and how far, by modification of the setting methods, it will be possible to vary the finish obtained from either method remains to be seen.

A factor which influences the choice is that, although it is possible to set with dry heat in a continuous manner, no such method is available for steam setting, which has, therefore, the snags attendant on a batch process. The tendency seems, therefore, to turn more and more to a continuous dry-heat setting. It is certain that no-one can say at present what is the best method or what will be the ultimate method.

The stage at which setting takes place should be, for most fabrics, as early in the processing as permissible. Ideally, setting should be the first operation after knitting. It is obviously more economical to do it at this point than to have to interrupt the scouring and dyeing processes to set, and then to resume operations. The objections to setting as the first step are the possibility of fixing stains and oils by the setting process, and, to some extent, the production of objectionable fumes in dry-heat setting owing to the oil present on the yarn.

Laboratory experiments have indicated that the conditions given in Table III will set nylon fabric, the measure of setting being less than 2% shrinkage after 1 hr. at the boil in water. It must be emphasised that the results are very approximate and refer to laboratory conditions. Nevertheless, they offer some guidance as to the conditions to be aimed at in practice.

TABLE III

Heat Set		Steam Set	
Approx. Time	Temp. (°C.)	Approx. Time	Steam Pressure (lb./sq. in.)
1-3 min.	170-175	7 min.	20
30 sec.	200-205	1 min.	35
10 sec.	215-220	10-20 sec.	55
<10 sec.	230-235		

Whatever the method of setting, the setting dimensions are the same as, or slightly greater than, the finishing dimensions.

Heat setting can be done on a pin stenter equipped with a high-temperature chamber, which will subject the nylon to the required temperature for the correct time. This is by no means as simple as it sounds. One of the difficulties is obtaining a uniform temperature throughout the setting period,

and from selvedge to selvedge and piece to piece. Lack of uniformity will be reflected in dyeing differences, and excessive heating in a yellowing of the nylon. The method is popular because it is a continuous operation.

Nylon diamond-mesh fabric, which is very prone to selvedge curl, is best set as the first operation. When using a modified pin-stenter, it is essential to have efficient selvedge-uncurling devices to ensure that the material goes on the pins in reasonable condition. After setting, the material is entered into a winch for scouring and dyeing.

Steam-setting methods vary with the type of equipment available. As far as setting is concerned, a high standard is attainable with a greater margin of safety than with dry-heat setting. With the nylon locknit previously mentioned, satisfactory setting has been obtained in the Brandwood pressure-dyeing machine (Fig. 9). The fabric, after

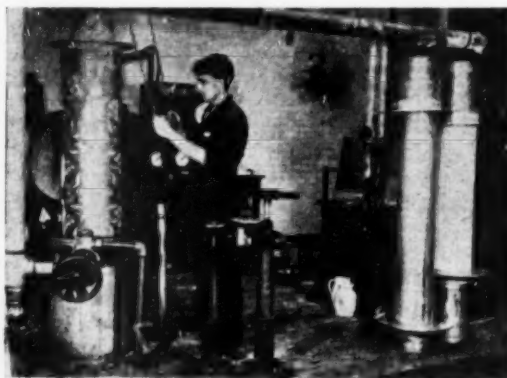


FIG. 9—Brandwood Pressure-dyeing Machine

a preliminary scour, is wound carefully on to a perforated Staybrite cylinder approx. 10 in. in diameter. This cylinder is equipped with adjustable flanges, which are set to the width of the material. Perforations outside the flanges are sealed with Staybrite bands. Up to four pieces of 50 yd. can be treated at a time, the pieces not being stitched together. The winding of the pieces tends to be a slow process; when complete, a wrapper is run on to protect the nylon. The cylinder is then mounted in the pressure vessel, and treated for 1 hr. at 15 lb./sq. in. pressure, the steam passing from the inside to the outside.

Scouring of the preset nylon is done in a winch: 32 pieces of 60 yd. are entered, and the ends stitched. Scouring consists in treating for 1 hr. at 50-60°C. in a solution of 0.015% soap and 0.03% solvent emulsion, rinsing in cold water, treating with dilute ammonia (0.15% of sp. gr. 0.900) for 20 min. at 50°C., and rinsing again. Bleaching is done with sodium chlorite*, the winch containing 600 gal. water, 6 lb. sodium chlorite, and 4½ pints of 80% acetic acid to give a pH of 4.8. The temperature is raised to 60°C., and a further addition of acetic acid is made to adjust the pH to 4.6. The bleaching is completed in 1 hr. After an addition of 2 lb. of

* See Appendix II (p. 58)

Dilatin



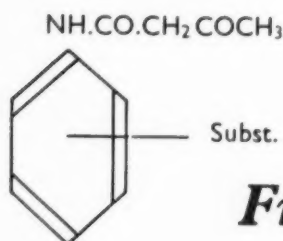
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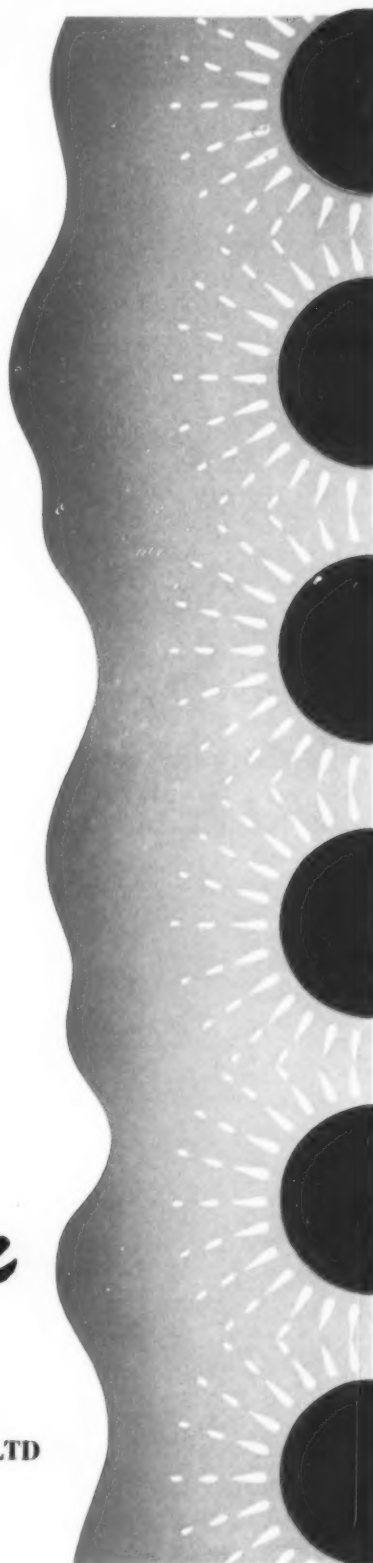


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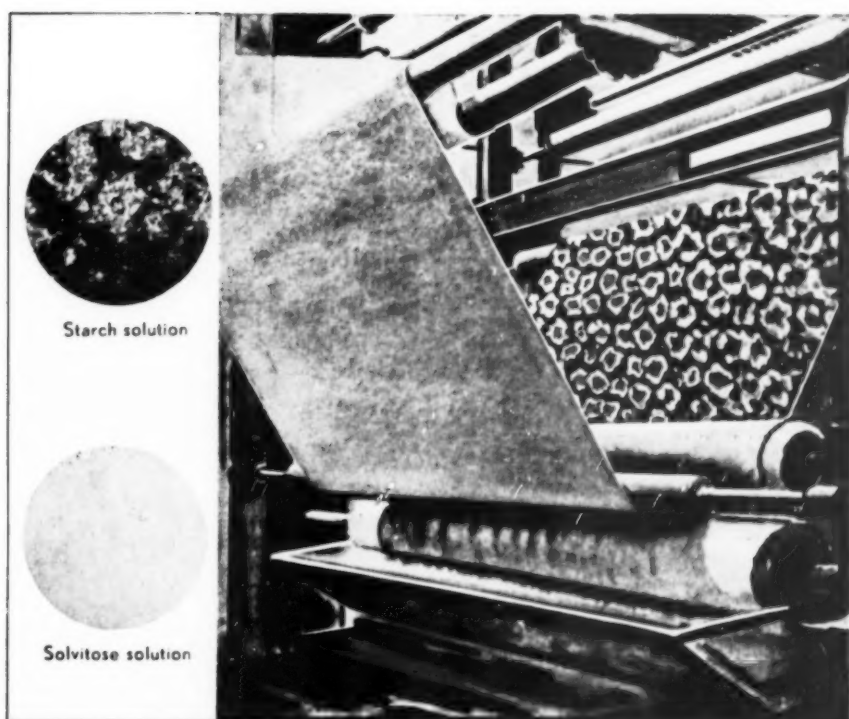
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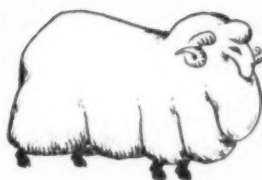
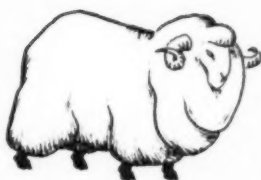
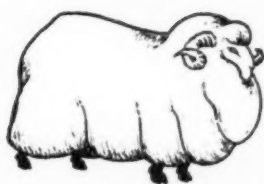
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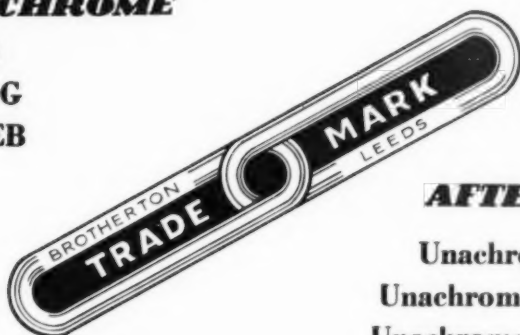


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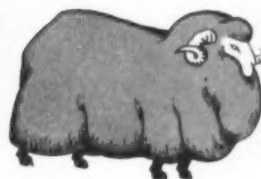


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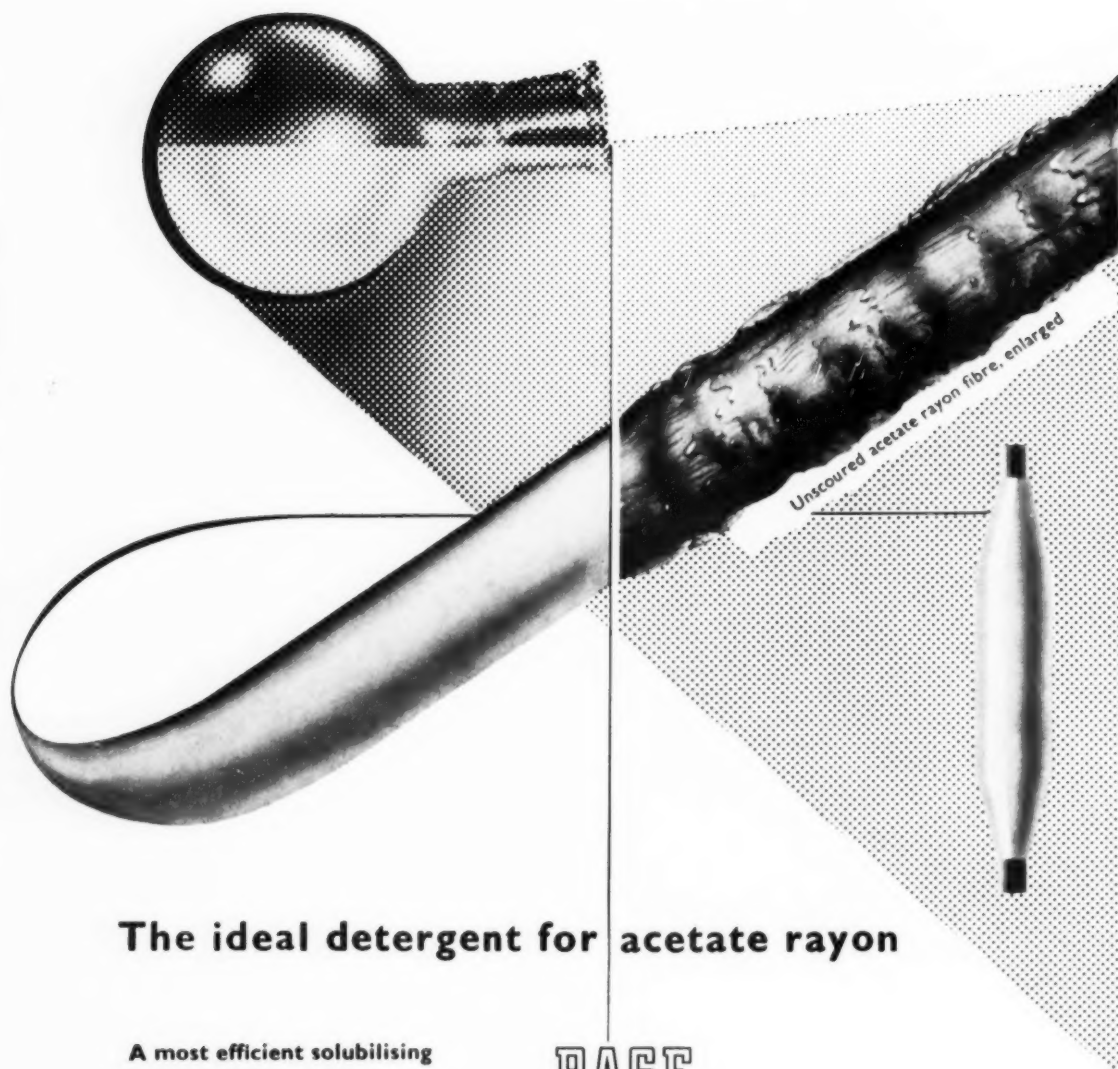
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sodium metabisulphite, the fabric is run for 10 min., and is then well washed, ready for dyeing. Provided setting has been uniform, dyeing with disperse dyes to pastel shades presents no difficulty as long as adequate time is allowed for levelling. After suitable rinsing, the fabric is removed by hand winch and placed in cotton bags to be hydro-extracted. The material then requires opening by hand, ready for drying on the stenter, care being taken that all pieces are stitched together the same way, so that the uncurling device on the stenter-fee can be effective. It is practically impossible, under normal conditions, to obtain a really satisfactory selvage with some of these fabrics, so in many cases the selvage is trimmed at the delivery end of the stenter. It will be found that considerable dimensional change will occur during the processing, and due allowance must be made for this, because, as mentioned previously, the setting dimensions and the finishing dimensions should be the same.

Nylon locknit material is processed in a similar fashion, but in this case there is not the same extensive change in dimensions. Nylon yarn can be used in other types of knitted constructions, e.g. for men's shirts, and also in admixture with rayon or as a blended yarn. In processing such fabrics the type of construction and amount of each component determine the method to be employed.

The latest developments with locknit-type fabrics have been towards the production of a stable material, without selvage curl. This is done by the knitter by employing a different stitch formation, and such fabrics show little or no stretch as compared with a normal locknit. These stable fabrics can be expected to extend the range of usefulness of knitted fabrics, and have the advantage of high rate of production. Because of their freedom from selvage curl, these types of fabrics are relatively easy to process in the winch without elaborate precautions, and they can, in fact, be scoured, dyed, and finished in a similar manner to woven rayon goods.

In conclusion it must be explained that emphasis has been laid on difficulties that may be encountered in processing warp-knitted rayons, and for the paper to be of value this is as it should be. Experience has shown that, once a suitable technique has been acquired, the processing is a straightforward and practical proposition.

APPENDIX I

Estimation of Soap in Cresylic Acid-Soap Mixture (Based on a method of Barr, Oliver, and Stubbs, *J.S.C.I.*, 67, 45 (1948))

REAGENTS—

Bromophenol blue, 0.04% in 20% aqueous ethanol
Chloroform B.P. (redistilled)
Standard cationic agent—cetyltriethylammonium bromide, ca. 0.25 g./litre.

Method for a Solution containing 2-4 g. Soap per litre

To 25 ml. of solution add 1 ml. of *N*-NaOH (to prevent hydrolysis of the soap) and dilute to 500 ml. Place 25 ml. of diluted solution, 1 ml. of *N*-NaOH, 25 ml. of chloroform, 100 ml. of water, and 5 drops of bromophenol blue in a stoppered reagent bottle, and titrate with standard

cetyltriethylammonium bromide in 1-ml. quantities until, on allowing to stand for 30 sec. and then shaking carefully, the chloroform layer is tinged blue.

If *t* ml. is the titre and *S* the concentration (usually 0.25 ± 0.002 g./litre) of the standard cationic agent of ionic equivalent $E' = 406$, and *C* the concentration (g./litre) and *E* the ionic equivalent of the soap, then—

$$\frac{E}{25C} = \frac{406}{tS} \quad \text{or} \quad C = \frac{E t S}{406 \times 25}$$

The concentration of soap in the original liquor is therefore—

$$\frac{20 \times E \times t \times S}{406 \times 25} = 0.002 E t S$$

The ionic equivalent *E* is the weight of soap stoichiometrically equivalent to one gram-ion of a pure reference compound—in this case cetyltriethylammonium bromide. It is determined by preparing an accurate solution containing 0.1–0.5 g. of the soap per litre, according to its approximate *E*, preferably by dilution from a more concentrated solution. 25 ml. of the soap solution is then diluted with distilled water and titrated with the standard cetyltriethylammonium bromide in the same manner as above.

If *t'* be the titre of the standard cationic reagent of ionic equivalent E' and concentration *S*, and *C'* the concentration of the test soap solution, then *E* is given by the equation—

$$E = \frac{25 \times C' \times E'}{t' \times S}$$

Estimation of Cresylic Acid in Soap Liquors

REAGENTS—

- Sodium chloride, pure or good technical quality
- Sodium chloride, 250 g./litre, containing 14 g. NaOH per litre
- Sulphuric acid, approx. 2 *N*. and 25% (vol./vol.)
- 0.1 *N*. "Available bromine", i.e. 2.78 g. KBrO_3 + 50 g. KBr per litre
- 0.1 *N*. Sodium thiosulphate, standardised against potassium dichromate.

Pipette 25 ml. of the soap-cresol liquor into a 100-ml. standard flask. Saturate carefully with salt, and dilute to 100 ml. with salt-caustic soda solution (b). It is important that little undissolved salt should be present. Filter off the precipitated soap through an open filter-paper, and pipette 50 ml. of the filtrate into a conical flask. Add 20 ml. of 0.1 *N*. bromine solution (d) to the solution in the flask, followed by 10 ml. of 2 *N*. sulphuric acid and a few drops of a suitable azo dye (e.g. Kiton Red) which is decolorised by excess of bromine. When this has occurred, wait for 15–30 sec. to ensure that the reaction is complete. Then add immediately 5 ml. of 20% potassium iodide, followed by a few millilitres of 25% sulphuric acid. Titrate the liberated iodine with thiosulphate (e) in the usual manner, using starch for the end-point.

In calculating the amount of cresylic acid present, it is obvious that, since the three cresols may be found in different proportions in various lots of cresylic acid, and since these absorb different proportions of bromine, the estimation can only furnish information as to how much of a given cresylic acid is present. A mean equivalent for any particular cresylic acid is determined as follows—

Determination of the Bromine Equivalent

Prepare accurately a solution of the cresylic acid containing approx. 2.5 g./litre in a minimum of caustic soda, and determine its bromine absorption exactly as described above. If *t* be the titre of 0.1 *N*. thiosulphate for a solution containing per litre *W* g. of cresol of equivalent *E*, then—

$$W = \frac{V - t}{1000} \times 0.1 E \times 2 \times \frac{1000}{25}$$

$$\text{or} \quad E = \frac{125 W}{V - t}$$

(*V* ml. = volume of 0.1 *N*. thiosulphate equivalent to 20 ml. of bromine solution (d)). Similarly—

$$W = 0.008 E (V - t)$$

W is usually of the order of 0.22–0.24 (*V* – *t*).

* For a pure compound, the ionic equivalent is equal to the molecular weight divided by the ionic charge carried.

APPENDIX II

Precautions to be taken with Sodium Chlorite

A recent experience with sodium chlorite may serve as a warning to others, and emphasise the necessity for caution in its use. An operative had received from the drug store 1 lb. of sodium chlorite, which he was carrying in a copper scoop. After about 30 sec. he noticed puffs of smoke arising from the sodium chlorite, and by the time he had reached the dye beck, which was some distance from the drug store, the whole of the sodium chlorite had burst into flames. The spontaneous decomposition was found to be due to a small trace of sodium hydrosulphite remaining in the scoop. The makers (Charles Tennant & Co. (N.I.) Ltd.) advise the following precautions—

Sodium chlorite should never be handled with any material containing sulphur, which causes spontaneous

decomposition. Natural rubber gloves, etc. should never be worn when handling this material, but synthetic rubber of the Neoprene type is quite safe; natural rubber is vulcanised with sulphur compounds.

In general, the same precautions taken when handling sodium chlorate should be observed with chlorite, e.g. keeping it away from easily combustible material.

When chlorite is used in acid solution, adequate ventilation should be provided to remove the chlorine dioxide gas which will be evolved, although this evolution can be suppressed by the addition of hydrogen peroxide.

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Notes

Annual Dinner

The Earl of Halsbury, F.R.I.C., F.Inst.P., has accepted an invitation to be the chief guest at the Sixty-ninth Annual Dinner of the Society, to be held on Friday, 10th April 1953, at the May Fair Hotel, Berkeley Street, London W.1. The chief guest is managing director of the National Research Development Corporation, which was set up under the provisions of the Development of Inventions Act 1948 to exploit or develop in the public interest such inventions or new techniques as, in its opinion, are not being adequately used.

Proceedings of the Council

At meetings of the Council held at the Offices of the Society, 19 Piccadilly, Bradford, on 10th December 1952 and 14th January 1953 the proceedings included the following items of interest—

ELECTION OF VICE-PRESIDENTS—A tentative scheme for the changeover from twelve Vice-presidents serving for three years (under the old Bye-laws) to six Vice-presidents serving for six years each (under the new Bye-laws approved at the 1952 A.G.M.) was accepted in principle for submission to the A.G.M. in 1954. It was resolved that in 1953 an election be held for one Vice-president to serve a term of six years.

SOCIETY'S MEDALS—The recommendation of the Medals Committee that no award be made for 1952 was adopted.

CHEMICAL SOCIETY JOINT LIBRARY COMMITTEE—Dr. T. H. Morton was nominated to continue to represent the Society during 1953.

A.A.T.C.C. ANNUAL CONVENTION 1952—Letters were read from the President of the American Association of Textile Chemists and Colorists expressing appreciation of the work of the Society's delegates at the I.S.O. Colour Fastness meetings in New York, of their presence at the A.A.T.C.C. Convention and Dr. P. W. Cunliffe's kind remarks thereat, and of the gift of a specially bound volume of *The Tintorial Arts To-day* (cf. J.S.D.C., 69, 25 (Jan. 1953)).

NOMINATION OF OFFICERS—It was resolved unanimously that Mr. H. Jennison and Mr. J. Barritt be nominated for election as Honorary

Treasurer and Honorary Secretary, respectively, for 1953.

Dr. C. M. WHITTAKER—Dr. Whittaker had expressed a desire to resign from the committees of which he was still a member—viz. the Society's Medals, the Historical Records, and the Perkin Centenary Committees. It was decided to accept his resignation with regret, but to request him to continue until the Annual General Meeting in April 1953.

MEMBERSHIP—Twenty-six applications for ordinary membership and seven for junior membership were approved.

Nomination of President

Council has learnt with very great regret that Mr. H. H. Bowen is unable to serve as President for a second year. Council has therefore unanimously nominated Mr. F. L. Goodall, M.Sc., F.R.I.C., for election as President for 1953–1954.

Meetings of Council and Committees January

Council—14th
Finance—20th
Publications—20th
Diploma—5th and 21st
Fastness Tests Co-ordinating—22nd
Colour Index Editorial Panel—30th
Terms and Definitions—30th
Society's Medals—14th
Examinations Subcommittee—14th

Catalogue of Books and Periodicals

A mimeographed list of books and periodicals held by the Society, most of which are available for borrowing by members of the Society, was sent with the January 1953 issue of the *Journal* to members resident in Great Britain and Ireland. Any members who may not have received a copy should apply to the Society at 19 Piccadilly, Bradford, Yorks.

Death

We regret to report the death on Christmas day 1952 of Professor M. G. Evans, F.R.S., Professor

of Physical Chemistry in the University of Manchester. He was well known for his work in photochemistry, and was joint author of a paper at the Society's symposium on "Photochemistry in relation to Textiles" in 1949.

Royal Society Davy Medal

The Davy Medal has been awarded to Professor Alexander Robertson for his researches into the chemistry of natural products, particularly the wide range of glycosides, bitter principles, and colouring matters containing heterocyclic oxygen atoms. His interest in the natural glycosides arose from his early studies with Sir Robert Robinson on anthocyanidins and anthocyanins, and led to the establishment of the structures of indican, the natural glycoside of indigo, and ruberythric acid, the glycoside of madder. Other natural products whose chemistry has been clarified by Robertson include the rotenone group of insecticidal compounds from derris root, usnic acid from lichens, the complex colouring matters rottlerin from kamala and dracorubin from dragons blood resin, the pigments of the insoluble red woods, the furanocoumarins and furanochromones, and the mould colouring matters citromycin and citrinin. In violacein, isolated from a micro-organism, he met the oxidation of hydroxyindole derivatives which is bound up with the formation of melanin in animals.

Centenary of the Patent Office

The "Great Seal Patent Office" was formed at the end of 1852 as a single office for granting letters patent for new inventions¹. Letters patent had been granted in 1449 by Henry VI to John Utynam for a process for making stained glass windows, the Statute of Monopolies (1623) had limited valid grants to new inventions, and a Patent Office near the site of the present building (off Chancery Lane, London) had been mentioned by Pepys in 1669, but before 1852 the unfortunate inventor had to visit many different offices. The Patent Law Amendment Act (1852) reformed the position, made provision for printing and publishing specifications and indexes, and introduced the use of provisional specifications, a valuable characteristic of many of the patents systems of the British Commonwealth. A library and a museum were founded, the latter soon being transferred to South Kensington. In 1883 control of the Patent Office passed from the Master of the Rolls to the Board of Trade and a comptroller-general was appointed, with responsibility for trade marks and registered designs as well as for patents. From 1905 the Office undertook to make the search for the novelty of the subject matter of patent applications.

An exhibition to commemorate the centenary was opened in the Patent Office Library on 17th December 1952.

¹ Blake, J., *Nature*, **170**, 1044-1046 (20th Dec. 1952).

Shelving of Science Centre Plans

On 17th December 1952 the Minister of Works stated in the House of Commons that "the planning of the science centre has had to be deferred in view

of the need for economy" (cf. J.S.D.C., **68**, 306 (Aug. 1952)).

Patents and Taxation

In a memorandum to the Royal Commission on Income Tax, the Institute of Patentees points out that, since income tax is now levied on receipts from the outright sale of an invention, but not on those from the sale or licensing of the use of drawings, technical information, and registered designs, patenting is being replaced by secret trading, so that an invention may never become public property.

Science and Technology Students in Britain

It appears from the University Grants Committee's *Returns from Universities and University Colleges in receipt of Treasury Grant for the Academic Year 1950-51* (H.M.S.O. 1952) that students in pure science represented 20.1% and in technology 12.4% of the total of full-time students; numbers increased by 251 to 17,168 in science, and decreased by 342 in technology, but there was a slight increase of 54 advanced students of technology. Of the 65,831 full-time men students, 21.1% were in pure science and 15.8% in technology; for women the corresponding figures were 19,483, 15.1%, and 1%. Among 4158 part-time advanced students, pure science claimed 8.7% and technology 9.6%.

Institute of Technology, Loughborough College

The Leicestershire Local Education Authority has been relieved of responsibility for maintaining the engineering and science departments of Loughborough College, which are to be organised as a separate establishment under the above name, maintained principally by an annual grant from the Exchequer.

British Association of Chemists

It is announced that the Hinchley medal has been awarded to Dr. Herbert Levinstein, and that Mr. F. Scholefield has been elected president.

Research Prize Essay Competition

Prizes of £100 and £50 are offered for papers about 3000 words in length discussing the possible industrial applications of some recent scientific investigation. Contributions should reach the offices of the journal *Research*, 4-6 Bell Yard, London W.C.2, by 30th April 1953.

The Drysalts Club of New England

This club, founded in March 1885, is the third oldest combined social and business club in New England¹. Its original purpose was the exchange of information which would enable prices to be kept up, and the membership was limited to the presidents or managers of New England chemical firms. The constitution of the club was liberalised in 1920, and its function is now social, with emphasis on good fellowship and food for the 120 members and their guests.

¹ Linberg, G. O., *Amer. Dyestuff Rep.*, **41**, P 665 (13th Oct. 1952).

American Dyestuff Reporter

The "Reporter" attained its thirty-fifth birthday on 8th October 1952. It had started in 1917 as an outgrowth of a section in *Dry Goods Guide* concerned largely with the dye situation in the U.S.A. during the First World War. It was at first published weekly, mainly for the dye user, and campaigned for tariff protection for the U.S.A. dyemaking industry.

In a commemorative article in the issue for 13th October 1952 (pp. 683-686) are reproduced an appeal by the late Prof. L. A. Olney for standard fastness tests (Sept. 1920) and an editorial urging the formation of a technical association of the American textile industry (6th June 1921), which led to the founding of the A.A.T.C.C. Beginning in January 1922, the monthly technical supplements and the weekly news editions of the *Reporter* were combined and published on alternate Mondays, the *Proceedings* of the A.A.T.C.C. being bound as the central portion of each issue.

New Workshops at Yateley

The Duke of Wellington recently opened new workshops at Yateley Textile Printers Ltd., Yateley, Hants. This firm is devoted entirely to the training and employment of crippled girls, who carry out the whole process of producing hand-printed fabrics and garments, creating their own designs, making the blocks, mixing the dyes, printing the fabrics, and making up the garments.

Closing of Bleaching and Dyeing Works

It is reported that the 157 years old bleach works of John Smith, Junior, & Son, Great Lever, Bolton, are to be closed down owing to the trade position.

After being in existence for 133 years the firm of John McNab & Co. Ltd., of Midtownfield Works, Howwood, Renfrewshire, is to close down. The company has specialised in the bleaching, dyeing, and finishing of material for window blinds. The history of the firm is outlined in the *Dyer*, 108, 482 (3rd Oct. 1952).

Reformed Technical Curricula

A recent American editorial (*Ind. Eng. Chem.*, 44, 2265 (Oct. 1952)) suggests that technical curricula might prove more fruitful if organised around "tool functions" rather than subject specialities, by selecting similar components from a number of established disciplines. Thus a research team might contain a measurement expert, whose training had acquainted him with all techniques of measurement and test apparatus design, rather than only those of physics, chemistry, or biology; an expert in recorded data, with a broad knowledge of sources and search techniques for assembling information; a team leader trained to analyse broad objectives and translate them into specific measurable factors; a "methods" man, skilled in statistics, analogy, and experimental approaches; and a theorist, able to frame logical hypotheses and interpret the fundamental significance of the data. When the project reaches pilot plant and production stages, the technologist can "supply the art and science of compromise when the limitations of

cost, equipment, and process must be accommodated". It is suggested that co-operative studies between industry and technical colleges should be started "to analyse in most fundamental terms the interrelated factors of educational preparation and organisational utilisation".

Technical Administrators

In an American article discussing the better utilisation of technical skill (W. von Pechmann, *Ind. Eng. Chem.*, 44, 89A (Dec. 1952)), it is suggested that technically trained personnel, especially in higher positions, devote surprisingly little time to matters requiring technical knowledge. "Job evaluation investigations in chemical plants almost invariably show that plant management's evaluation of administrative positions is too high and that of purely technical positions is too low." Many chemists and chemical engineers feel that they must leave their own field of interest and education in order to earn more money, and consequently industry is deprived of badly needed technical skill.

Economic Experimentation in Development Work

In a recent article in *Nature* (170, 138-140 (26th July 1952)), Dr. F. Yates, of Rothamsted Experimental Station, has shown that the most economic amount of experimentation is that in which the cost of the experimentation, apart from overheads, is equal to the expectation of loss due to errors. Although this result was obtained for the use of fertiliser on an agricultural crop, the author claims that the general principles enunciated are of wide application in many branches of industrial research.

Electronic Translations

Industrial and Engineering Chemistry reports (44, 11A (Dec. 1952)) that research is being undertaken on the problems involved in the mechanical translation of scientific matter from foreign languages into English, notably by J. W. Perry (Massachusetts Institute of Technology) and the National Bureau of Standards in the U.S.A. and by R. H. Richens and A. D. Booth in England. Although elegant, grammatically correct translations cannot be expected, machine translations from Russian have been made which are intelligible to a person acquainted with the technical background of the text but having no knowledge of Russian.

Treatment of Chrome Dermatitis

According to Dr. H. N. Cole in a paper to a recent meeting of the American Chemical Society, British anti-lewisite (B.A.L.) has been found most effective for treating chronic skin troubles due to chromium compounds.

Polyvidone (Polyvinylpyrrolidone)

The name *polyvidone* has been approved by the British Pharmacopoeia Commission for polyvinylpyrrolidone.

Synthetic Detergents and Sewage Disposal

It was stated in the House of Commons on 27th November 1952 that the Minister of Housing and

Local Government is arranging for an investigation of the technical problems resulting from the effects of the permanent foam-producing properties of certain synthetic detergents on sewerage processes and effluents.

Increase in Chemical Production since 1938 in the U.S.A., the U.K., Switzerland, and Germany

The President of the Verband der Chemischen Industrie, Herr W. A. Menne, speaking at a meeting held in Frankfurt-am-Main to celebrate its 75th anniversary, said that between 1938 and 1952 chemical production in the U.S.A. rose 300%, in the U.K. 240%, in Switzerland 210%, and in Germany 105%.

One of the founders in 1887 of the original Verein zur Wahrung der Interessen der Chemischen Industrie Deutschlands e.V. was C. A. Martius (of Martius Yellow fame), and its first president was F. Kalle, of Biebrich. c o c

Imports of Dyes in 1951

Imports of dyes in 1951 were valued at approx. £2.8 millions, 2½ times the 1950 figure (*Chem. and Ind.*, 1032 (18th Oct. 1952)).

U.S.A. Output of Phthalocyanines

The annual output of phthalocyanines in the U.S.A., by more than twenty firms, is estimated¹ as approaching two million lb., second in dollar value among the organic pigments.

¹ Permut, A., *Chemical Week* N.Y. (29th Nov. 1952); *Chem. Trade J.*, 131, 1460 (19th Dec. 1952).

New Documentary Films

Two new films are *Commission in Colour* (30 min.), produced by the ICI Films Unit, and *Das Werk am Rhein* (38 min., FBy), which won a prize at the 1952 Venice film festival.

Neoprene Paper in the Drying of Dyes

The use in a U.S.A. dyemaking plant of neoprene paper for lining the bottoms of stainless-steel drying pans for dye pastes is leading to savings of the order of \$5000 a year, as the dry dye adheres to neither the paper nor the pan.

History of Synthetic Alizarin

It is claimed by the Farbwerke Hoechst in the October 1952 issue of *Die chemische Industrie* that the preparation of alizarin by sulphonation of anthraquinone followed by alkali fusion was discovered by Riese in the Hoechst laboratories in April 1869, before the discovery of the dibromo-anthraquinone route by Graebe, Liebermann, and Caro and before the independent discovery of the sulphonation method by W. H. Perkin, senior (cf. *Chem. Trade J.*, 131, 1028 (31st Oct. 1952)).

Coloured Smoke in Skywriting

It is reported¹ that coloured smoke has been used for the first time in commercial skywriting over New York. Oil containing Oil Yellow (CCC), a dye previously used mainly in petrol and wood stains, was flushed through the exhaust manifold of the

aeroplane. Oil Scarlet (CCC) has been successfully tested, and it is suggested that fluorescent colouring matters may be used in the future for skywriting.

¹ *Amer. Dyestuff Rep.*, 41, 753 (10th Nov. 1952).

Wool Research in Australia

It is stated in the *Third Annual Report of the Commonwealth Scientific and Industrial Research Organisation for the year ending 30th June 1951* (Canberra 1952) that wool textile research has been extended to cover the improvement of wool as a textile fibre and the reduction of costs of production of woollen, worsted, and felted materials. Two processes have been recommended for the recovery of wool from sheepskin pieces and broken skins. A method has been developed for the alkaline hydrolysis of wool wax to wax alcohols and acids, and the study has been continued of the formation of fibres under natural conditions.

Nylon Yarn Patents

On 16th October 1952 the Court of Appeal upheld an interim injunction granted to British Nylon Spinners Ltd. to restrain Imperial Chemical Industries Ltd. from assigning or parting with certain patent rights acquired by the latter under an agreement of 31st December 1946 with E. I. du Pont de Nemours & Co. The U.S. District Court of New York on 30th July 1952 had declared that ICI should, within ninety days, reassign such patents to du Pont. It was held that in the present action (reported in *Chem. Trade J.*, 131, 974 (24th Oct. 1952)) the American court could have no extraterritorial jurisdiction, since the parties were both British and the subject in dispute concerned certain rights in British patents.

Output of Terylene

A factory costing £10 million is being built at Wilton (North Yorkshire), at which it is hoped that by 1954 the annual production of Terylene (ICI) fibre will be 11 million lb. Meanwhile, the pilot plant at Hillhouse, near Fleetwood (Lancs.), is producing 600,000 lb. a year from the polymer plant at Huddersfield. It is proposed to build up an administrative, technical service, and research establishment at Harrogate.

Thermal Decomposition of Linear Macromolecules

In a lecture in Glasgow to the Society of Chemical Industry, Dr. N. Grassie said that degradative reactions were often highly complicated, involving both oxidative and non-oxidative changes. Poly-methyl methacrylate degrades by a reverse polymerisation mechanism, polystyrene via weak links, and polyethylene approximately by random cleavage. Colour may result from the removal of acetyl groups from polyvinyl acetate.

Synthetic Fibres in Spain

Manufacture of synthetic linear polyamide (caprolactam) and polyacrylonitrile fibres is to be undertaken in Spain by a recently formed company "Inquitex" (Industrias Químicas Textiles). Capital has been supplied from Spanish and Swiss sources,

and the company will probably operate under Phrix licences.

Orlon in Europe

It is reported (*Textil-Praxis*, 7, 40 (Dec. 1952)) that Orlon is now manufactured in Germany.

Courlene Polyethylene Cloth

Cloth woven from spun-dyed Courlene (Courtaulds) polyethylene yarn has been introduced for protective clothing where contact with corrosive chemicals is likely.

Chlorosulphonated Polythene

This new rubberlike material was described by Brooks, Smook, and Busse to a recent meeting of the American Chemical Society. It is being produced in pilot-plant quantities, and can be hand ed in conventional rubber-processing machinery. Its unusual weather durability is shown by the fact

that, used as a fabric coating, it suffered no loss in toughness after two years' exposure in Florida.

Flameproof Textiles

In a lecture to the American Chemical Society (abstracted in *Chem. Trade J.*, 131, 1367 (5th Dec. 1952)), Dr. G. E. Walter stated that flameproof finishes fast to laundering had been obtained by introducing both nitrogen and bromine into triallyl phosphate.

Museum of Leathercraft

This recently founded museum is temporarily housed in the National Leathersellers College, Tower Bridge Road, London S.E.1. Its aims include "the establishment of as complete a historical record as possible of the preparation and use of leather, in all ages and all countries, by the acquisition of actual examples and of documents, prints, and books".

OBITUARY NOTICE

Frederick Wilson

The Society has sustained a great loss in the death of Fred Wilson. He acted as Vice-chairman of the West Riding Section throughout the period of the last war, supporting his Chairman friend and colleague, Fred Smith, in every possible way.

He joined the Society in June 1908. He served on the West Riding Section Committee from 1921 to 1950, as its Vice-chairman from 1930 to 1945. He was an Ordinary Member of Council from 1938 to 1945.

Born on 29th October 1875 in Bradford, he served his apprenticeship as a dyer, and then started business in 1903 as a partner in a dyeing and finishing firm—the Yeadon Dyeing Co. It must be said that he had far more than his fair share of trouble in the days when he was building his business. In November 1908 there was a fire at the Yeadon Dyeing Co. In November 1909 the business suffered the serious interruption of a strike of the workpeople just at a time when the firm was exceedingly busy. In February 1928 he founded the business of Frederick Wilson & Co. Ltd. at

Horsforth. In July 1933 there occurred a fire at the Horsforth premises. In 1937 he removed to the premises the business now occupies at Cookridge Mills, Horsforth.

The above details are given to show the quality of the man in his fine persistence in overcoming the varied obstacles to success.

Throughout the whole period of the writer's knowledge of him, he was the embodiment of quiet steadfast strength. He was a great friend of the West Riding Section and of the Society as a whole, as his membership of the various committees shows. I feel certain that I am speaking for all members of the West Riding Section who knew him during the hard years from 1930 to the present in saying how much we have appreciated his friendship and strength of character during the whole of this time. His example should stimulate our young members as well as us of the "old brigade", since he lived up to Kipling's lines—

If you can meet both triumph and disaster,
And treat those two imposters just the same . . .
... he did!

E. A. SWIFT

New Books and Publications

Introduction to Fibres and Fabrics Their Manufacture and Properties

By E. Kornreich. Pp. x + 193. London: National Trade Press Ltd. 1952. Price, 21s. 0d.

Starting with the physical structure and chemical constitution of fibres, an account is given of fibre technology up to a discussion of the wearing properties of the made-up articles. In Chapters 1-3 the properties and reactions of fibres, the growth and preparation of natural fibres, and the principles of the spinning of synthetic and regenerated rayons are reviewed. In Chapter 4 are outlined carding, combing, and spinning, followed by separate sections on the methods used to produce wool,

cotton, and silk yarns. Physical properties of yarns and the significance of twist and count are also discussed. The difficult task of explaining, at an elementary level, the principles of weaving, knitting, and lace-making is tackled in Chapter 5, which includes diagrams of the commoner types of structures. Finishing (Chapters 6-9) is divided into purification, dyeing and printing, drying, and special finishes; included are descriptions of the better-known machines and processes, a classification of the dyes employed, and an outline of fastness requirements. Stabilisation and shrink-resistance receive special attention. There is a brief account of the use of plastics in the textile industry, and a

final chapter on the causes of wear and tear. In three appendixes are shown respectively selected chemical equations illustrating natural and synthetic polymer formation, the formulæ of eight dyes, and a list of trade names of synthetic fibres.

Opinions may differ as to the correct method of presenting a book intended for, among others, non-scientific readers. On the whole, the object of providing a readable introduction to a very large subject is satisfactorily attained. The section on fabric structure would have been greatly improved by including a few close-up photographs of cloth structures, or even machines: a beginner will probably find this part hard to follow. Some inaccurate generalisations are made: the uninstructed reader will gain the impression that all raw wool is carbonised, that all warps are sized, and that jigs and calenders are used in wool finishing. The author appears to be much more conversant with the finishing of cotton than with that of wool: a milling machine is illustrated (p. 111) with an enormous liquor ratio, the reason for crabbing is wrongly explained, and hosiery finishing is virtually ignored. A few flow diagrams of finishing routines would have been of great value. The chapter on dyeing lacks a concise indication of the usual dye types for the various classes of fibres, and some idea could usefully have been given of typical quantities of dyes and assistants.

J. W. BELL

Einflüsse von Wasch- und Bleichprozessen auf Weiss- und Feinwäsche

By A. Schnyder. Pp. 147. Zürich: Verlag Leemann. 1952. Price, 15.00 Swiss francs.

This book is the fifth in the series of monographs from the Institut für Textilmaschinenbau und Textilindustrie of the Federal Technical College in Zürich.

The first section, of 108 pages, deals with trials in which undyed fabrics of cotton, linen, and, to a lesser extent, viscose rayon were washed by a variety of processes using soap or synthetic detergents in soft or hard water. After being laundered up to 100 times, the fabrics were examined for chemical damage (fluidity of cellulose in cuprammonium solution and of cellulose nitrate in a suitable solvent), loading with lime soap or inorganic salts, strength, extensibility, and a range of "serviceability" tests, including abrasion and flexing resistance, air permeability, and absorbency. Cleansing was estimated after three washes on standard soiled fabrics. A full account of this work was published in German about ten years ago, and a brief account in English can be found in *J. Textile Inst.*, 34, T29 (1943).

The second portion of the book deals with similar trials designed to compare the wartime substitute washing powders (containing less than 1% fat) with soap and a synthetic detergent. Processes using saponin and soda, soda alone, or plain water were also included, and hard water was used throughout. The range of fabrics was extended to include a cotton-viscose rayon mixture, staple and filament viscose rayon, and an acetate-viscose rayon mixture, although the washing processes were of a type primarily suited to cotton and linen.

The concluding portion of this book deals with washing trials on more sensitive materials, including wool, silk, viscose rayon, and, for comparison, cotton. The wash liquors contained soap, Igepon, or saponin, which were each used at four different pH values between 4.5 and 10.7. For some of the trials, the machine was run intermittently to reduce the mechanical action. The trials were confined to strength and extension except for wool, where colour, felting, shrinkage, porosity, and cleansing were recorded.

Many interesting observations were made. The loss of mechanical strength on repeated laundering occurs mostly during the rinses where there is little lather. Drying in the sun causes quite as much chemical damage as does careful bleaching with sodium hypochlorite or sodium perborate. Deposits of lime soap or inorganic salts in general have an adverse effect, particularly on the "serviceability" properties of the fabrics. The great majority of launderers in this country use soft water, and it is a pity from the point of view of the British reader, therefore, that most of the trials were carried out under conditions which gave heavy loadings.

The book is well produced, and there are only a few minor misprints. The experimental work is described in detail, except that specifications of the washing processes used in the middle section are, for some reason, incomplete. The whole volume probably represents the largest collection of comparative data on the properties of laundered fabrics that has so far been published.

G. R. PERDUE

Wasser und Abwasser in der Textilindustrie

By M. Kehren. Pp. 206. Basle: Schweizerische Vereinigung von Färbereifachleuten. 1951. Price, 16.90 Swiss francs.

After giving a very brief summary of the physical and chemical properties of water and the general characteristics of water supplies derived from rain-water, surface water, and ground water, the author passes on to a discussion of the qualities required in water to be used in the principal sections of the textile industry. For most of the purposes mentioned by the author it is concluded that a clear, colourless, soft water, free from iron and manganese, is required, and in the two following chapters an account is given of modern methods of treatment available for producing water of the desired quality. The processes dealt with include sedimentation and sand filtration, softening by precipitation and ion-exchange methods, avoidance of the effects of hardness by using synthetic detergents or by addition of compounds which form complexes (for example polyphosphates or the sodium salts of organic compounds of the type of ethylenediaminetetraacetic acid), and removal of acidity, dissolved gases, oil, iron, manganese, and silica.

The chapter on waste waters and their treatment deals almost exclusively with flocculation by salts of iron. The methods of producing ferrous and ferric hydroxide flocs, the mechanism of floc formation, and the types of plant which have been

developed for treating textile wastes by flocculation are discussed in great detail. In particular two processes, which have not been used in Great Britain but which are stated to have been used in Germany and Switzerland, are given considerable prominence. In one of these, the Niers process, iron turnings are allowed to dissolve directly in the waste water as it flows through a specially designed tank provided with a high-speed stirrer, and the mixture of waste water and coagulant so produced passes to a sedimentation tank in which sludge is separated before the treated liquor is discharged. In the second, the Pista process, the iron turnings are dissolved in a separate tank in water aerated by high-speed stirring, and the solution is added to the textile waste, the floc formed being removed by sedimentation as in the first process. It is claimed that a 50-60% reduction in polluting character of

the waste can be achieved by either of these methods.

Some of the methods of analysis applicable to water and waste waters are described in the final chapter. Notable omissions are the test for biochemical oxygen demand and the Versenate titration of hardness.

The author has attempted to deal with a very wide field in a small compass, and of necessity, therefore, the book can only be an outline of what he considers to be the most important points. This is particularly true of the analytical section, where the descriptions of methods are brief and in some cases may give a false impression of simplicity. The value of the book could have been enhanced by giving more references to the original literature—unfortunately very few have been given.

A. E. J. PETTET

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes.
Any publication abstracted may be referred to by members of the Society on application to
Dr. C. B. Stevens, Dyeing Department, Leeds University

Colorants de Tertre S.A.

DYES FOR PAPER—This card (French text only) contains dyeings in two depths on bleached paper of 114 dyes including members of the acid, direct, basic, sulphur, and pigment ranges.

DYES FOR JUTE—This card (French text only) contains dyeings on jute yarn of 58 Tertrodirect and Tertrodirect Fast dyes, 27 Tertroacid dyes, and 14 Tertrophene (basic) dyes.

DYES FOR COIR—This card (French text only) contains 56 dyeings on coir yarn, including 32 Tertrodirect and Tertrodirect Fast dyes and 24 of the Tertroacid range.

WOOL DYES—This card (German text only) contains dyeings in two depths on cloth of 95 Tertroacid, 50 Tertrochrome, and 36 Tertroxane (premetallised) dyes.

COTTON DYES—This card (German text only) contains dyeings in two depths on cloth of 64 Tertrodirect and 42 Tertrodirect Fast dyes.

TERTROUNION DYES—This card (German text only) contains dyeings on 50 : 50 wool-viscose rayon staple fibre mixture and wool-cotton mixture fabric of 73 Tertrounion, 38 Tertrounion Fast, and 25 Tertrochrome Union dyes.

Farbenfabriken Bayer

DIRECT DYES II—This card (German text) shows 123 dyes each dyed in two depths on cotton, viscose rayon, and cuprammonium rayon, and, in addition, neutral and alkaline discharges on bleached, mercerised cotton sateen are given. The dye names previously used have been revised, so that all the dyes are now included under one of the following generic names—Benzo, Benzo Fast, Benzamin, and Benzo Para. Dyes from the first three groups are shown diazotised and developed with the appropriate developer, while the Benzo Para group are coupled on the fibre with Parazol FB extra. Comprehensive information on the dyeing properties and fastness characteristics of dyeings of each dye is given.

Imperial Chemical Industries Ltd.

CHLORAZOL DIAZO ORANGE 2G—This direct dye gives bright oranges or yellows on cellulosic materials when diazotised and developed on the fibre with β -naphthol or Direct Developer Z respectively. It is particularly recommended for use alone or in mixtures where good fastness to wet treatments is desirable. Dyeings on cotton

developed with either developer are readily dischargeable with either acid, neutral, or alkaline Formosul, and good white discharges are also obtainable on silk. Fastness figures on cotton of dyeings developed with β -naphthol include—Light 2, perspiration 5, washing (five times at 40°C.) 3-4.

FD CALEDON POWDERS FINE FOR COTTON AND VISCOSE RAYON DYEING—This Technical Circular describes the properties and details the various methods of application of thirty-one FD-brand vat dyes. These wet out and disperse very readily in water to give pigment dispersions very suitable for application to cloth on the padding mangle or to wound packages in circulating-liquor machines. Methods of application for which details are given include the normal leuco method for yarn, pigment-impregnation methods for cotton and viscose rayon yarn including the Abbot-Cox process, and pigment-padding methods for cotton, viscose rayon, and cotton-viscose rayon mixture fabrics.

MONOLITE MAROON BS—This pigment gives full maroons, bluer, faster to light, of greater covering power, and capable of being oversprayed or overpainted as compared with the MS brand. Suggested uses include car lacquers, coach finishes, decorative paints based on oil or synthetic-resin media, leather finishes and leather cloth, and printing inks fast to soap.

THE VALUE OF PROCESSING AIDS IN THE HANDLING OF FIBRES AND FIBRE BLENDS—This is a reprint of the paper by P. T. Gale and H. Sagar first published in *J. Textile Inst.*, 43, p 496 (Aug. 1952).

DYESTUFFS FOR THE PRINTING OF NYLON—This card contains prints in two depths of forty different dyes arranged in two main groups. The first includes equalising and neutral-dyeing acid dyes, direct dyes, and water-soluble acetate rayon dyes, while the second is made up of disperse dyes only.

DURAZOL UNION DYESTUFFS—This range of dyes has been introduced for use primarily on 50 : 50 wool-cotton mixture cloth to produce dyeings having superior fastness to light to those obtained using the Chlorazol Union brands. Sixteen dyes are included in this card represented by dyeings in three depths (except in the case of the navy blue and black) on wool-cotton mixture cloth. Dyeings of ten neutral-dyeing acid dyes for shading the wool portion and of ten direct dyes for the same purpose on the cotton portion of such unions are also included.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., 68, 23 (Jan. 1952); while other abbreviations and symbols, together with a list of the periodicals abstracted, will be found at the end of the annual index

I—PLANT; MACHINERY; BUILDINGS

PATENTS

Thread Storage—Thread-advancing Device. American Viscose Corpn. BP 683,495

The thread-supporting bars are made from material, preferably glass tubing, which is non-corrodible with the type of yarn and chemicals in use. C. O. C.

Shrinkable Wrapper for Viscose Rayon Cakes. American Viscose Corpn. BP 683,184

Tissue paper which has been treated with blobs of regenerated cellulose, a water-insoluble alkali-soluble cellulose ether, or a melamine-formaldehyde resin has improved wet strength and on drying shrinks so that it conforms closely to the contours of a wrapped cake of viscose rayon. W. G. C.

Warp Drying. Bachmann Uxbridge Worsted Co. USP 2,601,080

The drying air is caused to pass uniformly through the warp throughout its width, thus giving uniform drying and so preventing rolling of the lateral margins of the warp. C. O. C.

Selvedge Guides. Heberlein & Co. BP 684,375

A simple and robust device is described. C. O. C.

Paper Coating. A. E. Staley Manufacturing Co. USP 2,599,947

A machine specially suitable for applying coloured starch-clay coating to corrugated paper board. C. O. C.

Dry-cleaning Machines. Detrex Corpn. BP 683,768

A dry-cleaning machine is described, at great length and with 38 diagrams, in which the cleaning solvent is protected from contamination by sealed bearings, filters, and condensers. It has automatic control, enabling a complete cleaning cycle and solvent reconditioning to be carried out. Gradual acceleration of the rotating drum allows more satisfactory adjustment of the materials to the high-speed conditions. J. W. B.

Drying Leather. Howes Leather Co. USP 2,601,150

Simple apparatus is described which stretches and dries double bends and double shoulders of leather uniformly and quickly throughout their entire areas without damaging the leather. C. O. C.

Photochemical Method of Engraving Textile Designs (IX p. 69).

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Effect of Potassium Chloride on the Equilibrium between Ethylenediaminetetra-acetate and Calcium Ions. F. F. Carini and A. E. Martell. J. Amer. Chem. Soc., 74, 5745-5748 (20 Nov. 1952).

The various ionisation constants of ethylenediaminetetra-acetic acid and the stability constant of the calcium-ethylenediaminetetra-acetate anion have been determined at various concentrations of KCl. The data are extrapolated graphically to infinite dilution to give the corresponding thermodynamic equilibrium constants. C. O. C.

PATENTS

Oxyalkylene Condensates—Auxiliary Agents. Monsanto. BP 683,884

The water-soluble, non-resinous products obtained by reaction of alkylene oxides with water-insoluble organic compounds containing a hydroxyl, carboxyl, amino, or mercapto group are detergents, softening agents, etc. C. O. C.

Water-soluble Surface-active Agents from Olefin Polymers. Standard Oil Development Co. USP 2,600,415

Exceptionally good surface-active agents can be obtained by sulphonating the pentamer and hexamer fractions obtained in a selective polymerisation of olefins. C. O. C.

Sulphonated Polystyrenes. Monsanto. BP 683,164

Sulphonated polystyrenes are prepared by treating polymerised styrene in an inert organic solvent with a complex of SO₂ and an organic compound which co-ordinates with it, which complex releases SO₂, below 50°C., e.g. the complex of SO₂ and dioxan or bis-β-chloroethyl ether. Use of these complexes prevents cross-linking of the polystyrene. The products are useful as sizes, protective colloids, adhesives, and dispersing, thickening, and tanning agents. C. O. C.

Desizing Compositions. Schweizerische Ferment. BP 682,878

A desizing composition with improved stability comprises dried amylase from animal and/or bacterial sources, common salt, and calcium sulphate.

Further improvements, e.g. in stability and (in soln.) wetting properties, are effected by incorporating one or more vegetable albumin-containing substances, e.g. lupin, bean, soya, or vetch flour. J. W. B.

Polyglycol Ethers of Organic Hydroxy Compounds, in Paste or Powder Form. Gy. BP 683,383

An oily condensation product from ethylene oxide (8-30 mol.) and 1 mol. of an 8-18 C fatty alcohol, an aromatic hydroxy compound containing at least one Alk of > 3 C, or an alicyclic-aromatic hydroxy compound is mixed with at least one-third of its weight of urea, its water-sol. homologues, and/or biuret. In one example the condensate of 1 mol. of oleyl alcohol and 20 mol. of ethylene oxide (40 parts) is mixed with biuret (60) to produce a dry white powder suitable as a levelling agent in wool dyeing. J. W. B.

Concentrated Solutions of Resin Precondensates. M. R. Wirth. BP 683,410

A water-soluble crystalloid-type dispersion suitable for impregnating textile fibres is obtained by treating formalin with dicyandiamide and > 3 times its weight of urea, thiourea, or melamine at pH 7-0 and concentrating the resulting solution to a syrup, paste, or solid. W. G. C.

Detergents. Henkel & Cie. BP 683,520-7

Addition of 2-10% of a colloiddally soluble magnesium silicate, e.g. magnesium metasilicate, to detergent compositions greatly reduces the formation of ash-forming deposits in the materials being washed in hard water. C. O. C.

Flameproofing Agents. Monsanto. BP 683,560

A mixture of (1) a film-forming condensate of "4:4'-dihydroxydiphenyldimethylmethane" with epichlorohydrin and (2) the product obtained by treating phosphoryl chloride with ammonia is a flameproofing agent for paper, applied from solution in a hydrocarbon solvent. After the treated paper has been heat-cured, the resultant flameproof is fast to water and weathering. BP 683,572

The water-insoluble condensate of phosphorus oxychloride and ammonia containing 32-43% P, 25-33% N (less than one-quarter being ammonia N), H, and O is a good flameproofing agent for textiles, paints, lacquers, resins, and chlorinated rubber. C. O. C.

Wrinkle-coating Compositions. New Wrinkle. BP 683,620

A wrinkle-coating composition yielding films of great homogeneity comprises polyvinyl butyral dissolved in n-butanol in presence of just enough water to cause the solution to become cloudy. C. O. C.

Coating Compositions containing Polyesteramides modified with Organic Polyisocyanates. ICI. BP 684,400

Modification of BP 579,340 (J.S.D.C., 62, 389 (1946)), the polyesteramide used being modified by pretreatment with an organic polyisocyanate but not to the stage at which it becomes insoluble in the solvent to be used. This makes the polyester tougher, more rubbery, non-thermo-plastic, and resistant to organic solvents. Compositions

based on these modified polyesters are suitable for application to rubber surfaces, particularly as top coatings on rubber-coated fabrics. C. O. C.

Water-soluble Derivatives of Unsulphonated Lignin—Tanning Agents. DuP. USP 2,600,606

Excellent tanning agents are obtained by reaction of lignin with boric acid and phenols followed by neutralisation with an alkali. C. O. C.

Destroying or Preventing Foaming in Liquids. S. BP 684,032

Addition of substances of formula $R^1 \cdot X^1 \cdot R^2 \cdot X^2 \cdot R^3$ (R^1 and $R^3 = \text{Alk}$; $R^2 = \text{hydroxyalkylene of 3-5 C}$; X^1 and $X^2 = \text{O or S}$; total C ≥ 15) prevents or destroys foaming. C. O. C.

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Aromatic Sulphonation. III—Correlation of the Velocity of Sulphonation with the *f*-Function of Sulphuric Acid. J. C. D. Brand and W. C. Horning. *J.C.S.*, 3922-3927 (Oct. 1952).

Aromatic Sulphonation. IV—Isomeric Ratios in the Sulphonation of Trimethyl-phenyl- and -*p*-tolyl-ammonium Methyl Sulphates. J. C. D. Brand and A. Rutherford. *J.C.S.*, 3927-3931 (Oct. 1952).

Nitration of 2-Acetamido-5-methoxytoluene. J. MacMillan. *J.C.S.*, 4019-4024 (Oct. 1952).

The preparations are described of the 3- and 4-nitro derivatives of 2-acetamido-5-methoxytoluene, of the corresponding amines, and of the *N*-acetyl-anthranilic and anthranilic acids. Dewar's 3-nitro-2-acetamido-5-methoxytoluene (*J.C.S.*, 619 (1944)) is now shown to be the 4-nitro isomeride, and the similar compounds described by Elderfield *et al.* (*J. Org. Chem.*, 12, 405 (1947)) require a like modification. H. H. H.

Absorption Spectrum of an Equimolecular Mixture of Azoxybenzene and Hydrazobenzene. R. J. W. Le Fèvre and J. Northcott. *J.C.S.*, 4082-4083 (Oct. 1952).

The spectra of *trans*-azoxybenzene, *cis*-azobenzene, an equimolecular mixture of *trans*-azoxybenzene and hydrazobenzene, and hydrazobenzene are compared. The absorption curve of the mixture is nearly the mean of those of its constituents, and different from that of *cis*-azobenzene, thereby indicating the probable non-identity of the latter with the former (cf. Le Fèvre and Souter, *J.C.S.*, 1595 (1949)). H. H. H.

Organotin Compounds containing an Azo Linkage. H. Gilman and S. D. Rosenberg. *J. Amer. Chem. Soc.*, 74, 5580-5582 (20 Nov. 1952).

When triphenyl-*p*-dimethylaminophenyltin was treated with *p*-nitro- or *p*-bromo-benzenediazonium fluoroborate, replacement of the triphenyltin group by the diazonium cation occurred. Triphenyl-*m*-dimethylaminophenyltin coupled normally with diazonium fluoroborates yields azo dyes in good yields. C. O. C.

Heterocyclics. XX—Absorption Spectra of Some Triarylmethane Dyes containing a Thiophen Ring. C. D. Mason and F. F. Nord. *J. Org. Chem.*, 17, 778-785 (1952); *Chem. Abs.*, 46, 10,023 (10 Nov. 1952).

Preparation of several triarylmethane dyes containing a thiophen ring is described, and their ultraviolet absorption spectra are compared with that of Thiophen Malachite Green. C. O. C.

Constitution of Sulphur Dyes. C. Michailidis. *Wien. Chem.-Ztg.*, 51, 9-15 (1950); *Chem. Zentr.*, II, 341 (1950); *Chem. Abs.*, 46, 10,625 (10 Nov. 1952).

A review with 23 references. C. O. C.

Indanthrene Dyes. I—Acidianthrene. K. Inukai and A. Veda. *J. Chem. Soc. Japan, Ind. Chem. Sectn.*, 53, 175-176 (1950); *Chem. Abs.*, 46, 9847 (25 Oct. 1952).

Acidianthrene has been prepared by Clar's method (*Chem. Abs.*, 34, 3262 (1940)) from anthrone and chloral. Use of conc. H_2SO_4 gives good results for both yield and purity in the initial condensation. C. O. C.

Absorption Chromatography of Flavonoid Compounds. C. H. Lee and S. H. Wender. *Anal. Chem.*, 24, 1616-1617 (Oct. 1952).

Mixtures of flavonoid colouring matters such as morin,

quercetin, rutin, quercitrin, and xanthorhamnin may be separated upon a column of Magnesol, by elution with ethyl acetate saturated with water. Several such separations and the purification of rutin are described. The method is given for preparing the column; the pH of the adsorbent is critical. J. W. D.

Formation of Tyrosine Melanin—IV. G. R. Clemo and F. K. Duxbury. *J.C.S.*, 3844-3848 (Oct. 1952).

The preparations of 1-*p*-hydroxybenzylethylamine and of several hydroxyphenylalanines are described, for use in a future study of the effect of alkyl substituents in the phenylalanine system on melanin formation. H. H. H.

Recent Trends in Organic Pigments. P. J. Whitaker and J. Smethurst. *Paint*, 22, 452-454, 469 (Dec. 1952).

There has been no major development in the organic pigment industry since the introduction of the phthalocyanines, but there have been considerable advances in improving the physical characteristics of many pigments and toners, which have resulted in many well established colours being used in some of the newer industries, e.g. plastics, and have made possible the use of certain organic pigments in the textile industry. These developments are reviewed, particularly as regards pigments for paints, printing inks, rubber and plastics, and textile printing. C. O. C.

Some Properties of Aluminium Flake Powder. IV—Degree of Flakiness. G. W. Wendon. *Paint*, 22, 455-459, 472 (Dec. 1952).

An account of investigations on the influence of the extent of milling, of polishing, and of the type of comminution process used on the size distribution of the resulting aluminium flake powder. C. O. C.

Review of Inorganic Pigment Progress. W. M. Morgans. *Paint*, 22, 447-451 (Dec. 1952).

Review of the literature published during the preceding 12 months. 70 references. C. O. C.

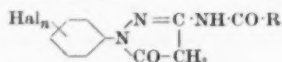
PATENTS

Colour Couplers. Gevaert. BP 683,702

Compounds of formula $\text{X} \cdot \text{C}(\text{CN}) : \text{CR}^1\text{R}^2$ ($\text{X} = \text{an electro-negative group}$; $\text{R}^1 = \text{H}$; $\text{R}^2 = \text{a carbo- or hetero-cyclic ring}$; or R^1 and R^2 together complete a carbo- or hetero-cyclic ring system) are colour couplers for use in colour photography. C. O. C.

Halogenated Pyrazolone Colour Couplers. Eastman Kodak Co. USP 2,600,788

Compounds of formula—



($n > 1$; $\text{CO} \cdot \text{R} = \text{acyl}$) are colour couplers for forming magenta dyes in colour photography. C. O. C.

Rhodamine Pigments for Colouring Plastics. ICI. BP 682,857

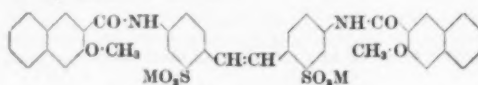
When a rhodamine dye, e.g. Rhodamine B or 6G (*C.I.* 747 or 752) is precipitated as its zinc chloride double salt on a lake base, the resulting pigment imparts to plastics brilliant colours, faster to light than those obtained with the original rhodamine or any hitherto known lakes of it. C. O. C.

Azo Dyes for Colour Photography. B. Gaspar. BP 683,064

Dyes of formula $\text{A}^1 \cdot \text{N} : \text{N} \cdot \text{B} \cdot \text{N} : \text{N} \cdot \text{A}^2$ (A^1 and $\text{A}^2 = \text{azo coupling components having ortho or para to the azo group a hydroxy, amino, monoalkylamino, or arylamino radical}$; $\text{B} = \text{an aromatic residue to which the diazo groups are attached in the para position}$) are exceptionally bright and of great brilliance of hue. Their absorption curves have a very steep increment. They dye gelatin cyans, blues, violets, and magentas of great clarity and excellent stability. They are readily bleached during development. C. O. C.

Fluorescent Whitening Agents. DuP. USP 2,600,004

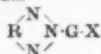
Compounds of formula—



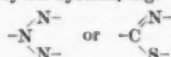
(M = H, alkali metal, or NH_4) are substantive to cellulose, on which they show intense whitish-blue fluorescence. They are excellent for adding to blue-violet whitening agents which by themselves tend to give a pinkish cast to cellulose. They exhaust from the liquor and fade at the same rates as the blue-violet whitening agents.

C. O. C.

Fluorescent Whitening Agents. FBy. BP 683,895
Compounds of formula—



(R is an aromatic residue linked to the triazole group by two neighbouring C; G = an aromatic grouping which in combination with the two groups attached to it imparts substantivity; X = an aromatic radical linked to G by means of a heterocyclic system, e.g.—

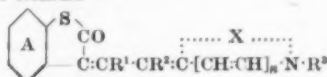


which carry sulphonic acid groups, are highly substantive to cellulose, are practically colourless, and show weak greenish to violet fluorescence.

C. O. C.

merocyanine Dyes. R. H. Glauret and F. G. Mann. BP 684,187

Dyes of formula—



(n = 0 or 1; R^1 = H or hydrocarbon; R^2 = H or CH_3 ; R^3 = hydrocarbon; X = atoms to complete a 5- or 6-membered ring or a polycyclic homologue thereof; A may carry one or more substituents or a fused ring) are useful as photographic sensitizers.

C. O. C.

Carbon Black. Columbian Carbon Co. USP 2,599,981
A method of producing carbon black by injecting a hydrocarbon into a turbulent stream of furnace gases.

C. O. C.

Neutral Inorganic Oxide Pigments. Säurefabrik Schweizerhall. BP 684,016

A completely neutral pigment is obtained if the acid-containing oxides are mixed dry with an alkaline-reacting oxide compound of the alkaline-earth metals or magnesium and are then moistened with water and dried.

C. O. C.

Stable Indicator Solutions for Complexometric Determination of Total Hardness in Water (XIV p. 71).
Study of the Diphenylamine Test for Aliphatic Nitro Compounds (XIV p. 71).

V—PAINTS; ENAMELS; INKS

PATENTS

Coating Compositions and Printing Inks. IC.

USP 2,600,593

In making paints, printing inks, etc. in which the pigment consists of a dye dissolved in or absorbed by resin particles dispersed in the varnish or vehicle, preparing the pigment *in situ* halves the steps needed to produce the paint, etc., and in some cases results in considerable saving of dye.

C. O. C.

Printing Inks, etc. India—Council of Scientific & Industrial Research. BP 684,328

Addition of 5–10% of a resinol or its derivative, e.g. bhillawan shell liquid or Japanese lacquer (kio rushi), to inks containing either mineral or vegetable oil as the vehicle reduces the viscosity.

C. O. C.

Air-drying Wrinkle Finish. New Wrinkle.

USP 2,600,818

Cold-blending a non-wrinkling varnish with raw tung oil yields a product which forms coatings with a uniform wrinkle texture without being heated.

C. O. C.

VI—FIBRES; YARNS; FABRICS

Influence of Molecular Structure on Properties [of Fibres]. H. Mark. *Ind. Eng. Chem.*, 44, 2110–2114 (Sept. 1952).

A review of the effect of macromolecular structures on fibre properties. The dependence of tensile strength,

elongation to break, and abrasion and fatigue resistance on average molecular weight, and the tendency of uneven molecular-weight distribution to cause brittleness and difficulties in filtration, deaeration, and spinning are discussed. The need for regularly distributed sites of intermolecular cross-linkages leading to the formation of crystalline regions is emphasised.

A. J.

Pile Fabrics. J. P. Malik. *Ind. Eng. Chem.*, 44, 2147–2149 (Sept. 1952).

A brief review of the use of synthetic fibres for pile fabrics, particularly the use of nylon for an imitation wolverine.

A. J.

Ion-exchange Cottons. J. D. Guthrie. *Ind. Eng. Chem.*, 44, 2187–2189 (Sept. 1952).

Certain chemically modified cotton fabrics exhibit ion-exchange properties. Examples of cation-exchange cottons are—(a) phosphorylated cotton, prepared by treating cotton with phosphoric acid and urea at 150°C., ion-exchange capacity (C) = 2.6 (m-equiv./g.); (b) sulpho-ethylated cotton, by the action of 2-chloroethanesulphonic acid in NaOH soln., C = 0.5; (c) partly carboxymethylated cotton, C = 0.3; and (d) succinic half ester, by the action of succinic anhydride in dry pyridine, C = 0.3. Sulphato- and phosphato-ethylated cottons are also mentioned. Examples of anion-exchange cottons are—(a) aminised cotton, by the action of 2-aminoethylsulphuric acid in NaOH, C = 0.6; (b) aminised-iminised cotton, by the action of ethyleneimine vapour on aminised cotton, C = 2.6; and (c) quaternary aminised cotton, by the action of 2-chlorotriethylamine and NaOH followed by alcoholic methyl iodide, C = 0.3. Some uses for ion-exchange cottons are suggested, e.g. for some filter cloths and for de-ionising protein hydrolysates.

A. J.

Homogeneous Degradation of Cellulose. H. M. Spurlin. *Text. Research J.*, 22, 693 (Oct. 1952).

The question whether or not native cellulose is molecularly dispersed in 85% phosphoric acid is raised, and it is recommended that independent checks should be applied to solutions used in homogeneous cellulose hydrolysis to make sure that they are molecularly dispersed. The use of high-speed centrifugation, flow birefringence, electron microscopy, and light scattering is suggested.

A. B.

New Method for the Biological Retting of Flax by the aid of Denitrifying Bacteria. A. A. Kopyev and T. M. Dulman. *Tekstil. prom.*, 12, 21–23 (June 1952).

Flax is retted in presence of a nitrate and of denitrifying bacteria, e.g. *Bact. pyocyaneum*, which are very active and, while taking part in the breakdown of carbohydrate material, cause the accumulation of organic nitrogen in the soln. and prevent the soln. from becoming markedly acid, thus establishing favourable conditions for the fermentation of pectins. The method is 30% more rapid than the usual warm method of retting and is recommended for large-scale use, though it is pointed out that further improvements can probably be effected in the method, e.g. the use of cheaper nutrients in the preparation of the bacterial cultures and the use of regenerated retting liquors.

A. E. S.

Heterogeneous Structure of Rayon.

I—Heterogeneous Acetylation of Rayon. S. Okajima, S. Hayama, and Y. Kobayashi. *Bull. Chem. Soc. Japan*, 25, 271–275 (Aug. 1952).

II—Degree of Orientation of the Skin and of the Core of Rayons. Idem. *Ibid.*, 275–279.

I—Acetylation of three samples of normal viscose rayon, a viscose rayon tyre cord, and a normal cuprammonium rayon is found to occur concentrically when 1 g. of sample is acetylated in 30 g. benzene, 10 g. acetic anhydride, and 0.65 ml. conc. H_2SO_4 at 40–60°C. The acetylated outer layer can be removed by CHCl_3 followed by 0.2 N-NaOH. The residue is designated a “peeled-off” fibre.

II—The intrinsic double refraction I' of peeled-off fibres from I is measured, and plotted against % cellulose removed by acetylation. With vacuum-dried samples, the radial distribution of I' shows a constant value during the removal of the outer skin, decreasing through a transitional stage to a lower constant value for the core. The skin shows a greater resistance than the core to penetration and dispersion during acetylation.

A. J.

Feltability of Textile Fibres. A. I. Meos. *Tekstil. prom.*, 12, 26-27 (Aug. 1952); *Textil-Praxis*, 7, 908-910 (Nov. 1952).

The ability to felt is not confined, as often stated, to fibres that have surface scales—it can be demonstrated to occur in materials consisting of rayon staple or, particularly, of artificial protein fibres. The principal factors determining feltability are the formation of intermolecular linkages between the surfaces of two fibres that are brought into contact during milling and the reduction of the elasticity of the fibre under milling conditions. The former is greatly facilitated by freeing the surface groups from association with contaminating molecules, and the latter depends largely on the swelling properties of the milling soln. Subsidiary factors, operative in the case of wool, are mechanical effects due to surface scales and curliness.

A. E. S.

Tensile Properties of Newer Fibres. J. H. Dillon. *Ind. Eng. Chem.*, 44, 2115-2122 (Sept. 1952).

Stress-strain curves to break are given for single fibres of viscose rayon, acetate rayon, nylon, Orlon, Dacron, dynel, Acrilan, X-51, Vicara, and regenerated silk, and the relative behaviour is expressed in terms of their chemical structures. The results of repeated stress-strain experiments, where single fibres are successively extended and retracted three times, relaxed, and extended to break for extensions of 3%, 10%, and 20% are presented as "cycling profiles", in which the max. load for each stress-strain cycle and the load after relaxation are expressed as % of final breaking load and plotted as bar charts. From the cycling profiles the viscoelastic properties of the fibres may be compared. The effects of fibre morphology on mechanical properties, and the effects of crimp on the measured Hookean modulus are discussed.

A. J.

Functional Properties of Synthetics. J. B. Quig and R. W. Dennison. *Ind. Eng. Chem.*, 44, 2176-2183 (Sept. 1952).

The chief physical properties of synthetic fibres are reviewed, and compared with those of the natural and regenerated fibres. The properties of various blends containing synthetic fibres are given.

A. J.

Dichroic Study on Polyvinyl Alcohol Fibre. II—Effect of Crystallinity and Moisture Content of Fibres on their Deformation. S. Okajima and Y. Kobayashi. *Bull. Chem. Soc. Japan*, 25, 268-271 (Aug. 1952).

Changes in dichroic constant D ($= K_{\parallel}/K_{\perp}$, the K s being absorption coefficients for oscillation parallel and perpendicular respectively to the fibre axis) with degree of stretching v ($= l/l_0$) are measured for three series of polyvinyl alcohol fibres dyed with Congo red. Samples from each of the three series (A—uncrystallised; B—partly crystallised by heating in 40% $(\text{NH}_4)_2\text{SO}_4$ soln. at 140°C. for 1 hr.; C—heated in 50% $(\text{NH}_4)_2\text{SO}_4$ as above) were conditioned at 100%, 93%, and 81% R.H. before stretching. Plots of $\log D/v$ are compared with the calculated curve (Kratky, *Kolloid Z.*, 64, 213 (1933)), with reasonable agreement. With all three series, v_{max} occurs with fibres conditioned at 100% R.H., when $v \approx 6$ and $D \approx 1.2$, corresponding to almost complete orientation. Decreased moisture content and increased crystallinity both cause a reduction in v at break.

A. J.

PATENTS

Degumming and Removing the Cuticle of Ramie. E. C. Duhamel. *BP* 683,602

Ramie, or other bast fibre, passes from the scutcher in regular bundles, held together if necessary by spirals of roving of the same material, and proceeds through successive degumming baths containing progressively increasing quantities of e.g. caustic soda, between which the fibre bundles are well squeezed. Remaining portions of cuticle are removed, and the material can proceed to combing without intermediate carding; waste and the proportion of short fibres are reduced.

J. W. B.

Viscose Rayon of Improved Colour. Courtaulds. *BP* 683,646

Viscose is extruded into a coagulating bath, and the thread, if desired after stretching, is passed straight to a helical advancing reel, where it is treated simultaneously with dil. H_2SO_4 at $< 40^\circ\text{C}$. and with an aqueous solution of an oxidising agent, e.g. sodium hypochlorite, washed,

and dried. Contact with acidified hypochlorite is too brief for severe damage to occur, and the colour is substantially improved.

J. W. B.

Adhesive Tab-labels for Use on Fabrics during Laundering, Dry Cleaning, etc. (XV p. 72).

VII—DESIZING; SCOURING; CARBONISING; BLEACHING

Detergency. II—Removal of Oil from Wool Fibres.

W. W. Mansfield. *Austral. J. Appl. Sci.*, 3, 192 (1952); *J. Soc. Leather Trades Chem.*, 36, 294 (Sept. 1952).

Using mixtures of paraffin oil with oleic acid, undecanol, glycerol mono-oleate, and tripalmitin respectively, the removal of oil from wool fibres has been studied visually. Certain observations recorded have been correlated with the results of small-scale washing tests. The possibility of removing oleic acid-paraffin mixtures without the use of a detergent is demonstrated. Detergency of the oil occurs on aeration of a wool sample supported under water. It is shown that the addition of alkali to soap solutions hinders the removal of oil from wool unless the oil contains more than about 5% of the interface-active compounds other than fatty acid. This depressant action of alkali is prevented by the addition of salt to the soap solution. Droplets of oleic acid-paraffin oil mixtures adhering to the wool fibres follow a striking cycle of transformations in drop shape on addition of alkali to the surrounding water. The nature and significance of the cycle are discussed.

C. J. W. H.

PATENTS

Loose Wool Washing. W. W. Spooner. *BP* 683,137

Loose wool is passed on a brattice conveyor through an aqueous bath, where one or more jets of water are directed vertically downward through the wool, thus dislodging many impurities. In one example a merino wool having a 50% grease-dirt content is thus washed using water alone, and 16% of the impurities are removed. The wool is brought to a loftier condition, which is an advantage in subsequent soap and alkali scouring.

J. W. B.

Sulphur Stoving of Wool Garments. I. & R. Morley.

BP 684,185

The garments are suspended in a gas-tight chamber provided with a fan or blower to force air into the chamber to burn sulphur placed in it. There is an outlet pipe from the chamber to an air-tight tank, which has an outlet connected to an extractor fan or vacuum pump. The outlet from the chamber extends nearly to the bottom of the tank, which is filled to a suitable depth with a liquor which absorbs SO_2 . The outlet from the tank is always above the level of this liquor.

C. O. C.

VIII—DYEING

Turkhead Continuous Process for Dyeing Ribbon.

[L. Clarke.] *Times Review of Industry*, 58 (Oct. 1952).

This process, invented by Mr. L. Clarke of William Franklin & Son, Coventry, uses small "turbulence cells" in which the ribbon is impregnated in 10-20 sec. Concentrated dye liquor is kept in stainless-steel stock tanks and pumped to the turbulence cells as required. In one run of 21 hr., 72,000 yd. of ribbon was dyed without any variation in accuracy of matching. It is believed that the process can be adapted to the dyeing of wider fabrics.

C. O. C.

Relation between Certain Defects in Dyed Fabrics and Mechanical Damage in Wet Processing.

D. M. Cates, K. S. Campbell, and H. A. Rutherford. *Text. Research J.*, 22, 623-630 (Oct. 1952).

It is shown that mechanical damage by abrasion on the surface of cotton, viscose rayon, Fortisan, and acetate rayon fibres results in an increase in the initial rate of dyeing at the damaged area. After longer dyeing times, when both areas contain the same amount of dye, any apparent difference in depth of colour is optical in nature, and it is most common for the abraded portion to appear lighter.

A. B.

Neolan Dyes. W. Wimer. *Chimia*, 5, 77-79 (1951); *Brit. Abs.*, B II, 35 (Jan. 1952); *J. Textile Inst.*, 43, A 728 (Oct. 1952).

Neolan dyes are chromium complexes of monoazo dyes, either 1:1 or 1:2 complexes. Comparison shows the

1:1 complexes to be the more useful. Complex stability and the mechanism of adhesion to the fibre are discussed; in some cases colour changes occur during the dyeing process owing to partial demetallisation of the complex.

C. J. W. H.

Redox Potential as a Critical Factor in the Hill Reaction. J. S. C. Wessels and E. Havinga. *Rec. Trav. chim.*, 71, 809-812 (July 1952).

The photochemical reduction of various quinones and dyes in water in the presence of chloroplasts was followed by measuring the redox potential before and during illumination. It was found that whether or not reduction would occur depended on the standard redox potential of the substance. Of 25 quinones and 15 dyes examined no reduction was observed when the reduction potential was below about 40 mv. In the case of the dyes reduced, decolorisation was also observed.

W. J. M.

Stability of Hydrosulphite in Aqueous Solutions. N. P. Solovyev. *Tekstil. prom.*, 12, 34-35 (July 1952).

Experiments are described that indicate the great reduction in the stability of hydrosulphite in alkaline soln. attributable to the use of open dyebaths. It is shown also that, as the concn. of hydrosulphite falls during vat dyeing in open vessels, the limiting concn., at which unreduced dye makes its appearance in the bath, is decreased greatly by the addition of gum tragacanth or surface-active agents and is increased by raising the concn. of electrolyte.

A. E. S.

PATENTS

Dyeing Cellulose Esters with Vat Dyes. Celanese Corp. of America. *USP* 2,598,786

Heavy acetate rayon fabrics can be continuously dyed, with good levelling and penetration and no undue saponification, by padding with an aqueous dispersion of a free leuco vat dye (by the vat acid method), drying, padding with an aqueous alkaline soln. of a formaldehyde-sulphoxylate reducing agent and an alkali-metal carbonate, steaming, and then oxidising. The dyeings are fast to rubbing and there is no substantial loss in weight of the rayon.

C. O. C.

Modifying the Dyeing Properties of Nylon. British Nylon Spinners. *BP* 682,975

When nylon is treated with aqueous hypochlorite it is given increased affinity for basic dyes but decreased affinity for acid, premetallised, chrome, and water-soluble acetate rayon dyes. The magnitude of the effect depends upon the pH of the hypochlorite and the individual dye.

C. O. C.

Preparations for Dyeing Paper. Gy. *BP* 683,128

A mixture of a basic dye, a heteropoly acid capable of forming a lake with the dye, and a preferably anionic dispersing agent, when added to water, forms the lake immediately as a very fine dispersion, which is very stable and in most cases persists for several days. Such a mixture yields on paper level dyeings of very good fastness to light.

C. O. C.

IX—PRINTING

Photochemical Method of Engraving Textile Designs.

S. A. Vvedensky, M. A. Volkov, and T. T. Kombegov. *Tekstil. prom.*, 12, 30-33 (July 1952).

A detailed description is given of a method of making dies for the engraving of calico-printing rollers. It consists in covering a steel cylinder with a shellac- or Bakelite-dichromate layer, exposing to light through a diapositive made from the design, washing away the unexposed parts of the sensitive layer, reinforcing the residual layer if necessary, and finally etching. Engraving with dies prepared in this way is of wide application and is superior in many ways to photomechanical methods.

A. E. S.

Prerequisites for the Reduction of Steam Consumption in Reducing Agers. B. A. Kozlov. *Tekstil. prom.*, 12, 31-34 (June 1952).

An examination of the literature shows that, in the ageing of vat-printed fabric, maintenance of the air content of the ager below the permissible level and neutralisation of the effects of exothermic reactions occurring on the fabric lead to the necessity of providing an excess of saturated steam. The data presented must be taken into account when designing agers with a view to the reduction of steam consumption.

A. E. S.

PATENTS

Colour Photography. H. von Fraunhofer and R. H. Bombach. *BP* 684,248

The multilayer negative material used comprises three superimposed layers of silver halide emulsion sensitive respectively to the three primary colours. The two lower layers contain different colour-forming substances, while the top layer contains no colour-forming substance. The exposed negative has the image in the top layer developed, and this image is then copied by applying that layer after development and without further treatment in intimate contact with another support, so that the unreduced silver halide in that layer becomes transferred by diffusion to the other support, where it is reduced to form a positive image. The coloured images are then developed in the two lower layers and the silver images bleached out from all the layers, thus leaving the top layer clear.

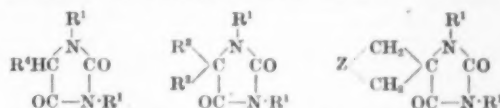
C. O. C.

Inhibiting the Degradation of Colour Photographs.

General Aniline.

BP 684,540

Colour photographs are protected against heat, extreme humidity, and residual chemical fuming by adding to the final rinse bath a compound of formula—



(R¹ = H or CH₂OH; R² = lower Alk; R³ = lower Alk or alkoxyalkyl; R⁴ = H or lower Alk; Z = the bivalent radicals needed to complete a 5- or 6-membered cycloaliphatic group) or the water-soluble formaldehyde addition product of such a compound.

BP 684,541

The water-soluble addition product of formaldehyde and a compound of formula R¹-NR²-CO-NHR³ (R¹, R², R³ = H or lower Alk, R⁴ being always H when both R¹ and R² = Alk) is used.

C. O. C.

Colour Correction of Coloured Photographs produced by Dye Imbibition. Eastman Kodak Co.

USP 2,600,756

Photographic Product comprising a Light-sensitive Diazonium Compound, a Coupler, and a Rupturable Containing Means holding Ammonia under Pressure. Polaroid Corp. *USP* 2,600,996

X—SIZING AND FINISHING

PATENTS

Moiré Finish. H. A. Holterhoff. *USP* 2,598,795 *BP* 685,724

Apparatus is described in which the fabric is moistened in patterned areas and the spreading bars or the like are heated, this immediately stabilises and fixes the wetted design-forming areas as soon as they touch the spreading bars, the moisture also being prevented from being transferred beyond the borders of the design.

C. O. C.

Neutralising Acid-containing Wool. J. A. Perry.

BP 683,080

A two-stage method of neutralising acidified wool, particularly after carbonising loose wool in initial processing, consists in immersing the wool in an aqueous soap-free soda-ash solution in which the amount of Na₂CO₃ is restricted, so that neutralisation first proceeds entirely to the bicarbonate stage, and finally completing neutralisation by using this bicarbonate, preferably at a higher temperature, instead of doing all the neutralising by a carbonate-bicarbonate reaction. The process is preceded by the usual aqueous rinse and is followed by the usual soap-soda wash; even so, a substantial saving of soda ash is effected, and the wool is less likely to be damaged.

J. W. B.

Rendering Proteinaceous Textiles Water-repellent.

Harris Research Laboratories.

USP 2,599,590

The material is treated first with a 0.01-1.0% aqueous solution of a fatty-acid soap and then with a 0.05-1.0% solution of a water-soluble aluminium salt.

C. O. C.

Hair-waving Composition. M. D. Zoppo.

USP 2,600,624
Hair is cold-waved by softening the keratin with a thiocarbonic ester of glycollic acid or like aliphatic α -hydroxy acid together with an amine to keep the pH 8–10, and then removing the softening agent. The effect on human hair is improved if a mild reducing agent, e.g. ascorbic acid, is also present.
C. O. C.

Stabilising Regenerated Cellulose Fibres to Heat.

United States Rubber Co. BP 683,203
Protection against heat ageing is conferred by impregnation with a primary organic amine of b.p. < 75°C. and m.p. > 150°C., the amount used being in excess of that which reacts with the fibres during heat-ageing tests.
C. O. C.

Flameproof Textiles (Notes p. 62).

Feltability of Textile Fibres (VI p. 68).

XI—PAPER AND OTHER CELLULOSIC PRODUCTS**Primary Reactions in the Oxidation of Cellulose by Hydrogen Peroxide.** V. I. Ivanov, E. D. Kaverzneva, and Z. I. Kuznetsova. *Doklady Akad. Nauk S.S.S.R.*, 86, 301–304 (11 Sept. 1952).

Cotton cellulose is treated with hydrogen peroxide in acid, neutral, or alkaline soln., generally in presence of FeSO_4 as catalyst. The following characteristics of the product are measured—total carboxyl content, uronic carboxyl content, and the contents of ketone and aldehyde groups. Even under severe conditions of treatment (e.g. H_2O_2 50 g., NaOH 100 g. per litre; 40°C.; > 10 hr.) only a small number of any one of these functional groups make their appearance. Thus the highest carboxyl content observed corresponds to only 12 COOH per 1000 glucose residues, whereas the same authors previously obtained a content of 40 COOH per 1000 glucose residues in the course of a hypochlorite oxidation. The rate of oxidation is about three times as great at pH 4.6 and at pH 12 as at pH 7, and several types of reaction occur, viz. conversion of the CH_2OH side-chain to CHO and COOH, of $-\text{CH}(\text{OH})-\text{CH}(\text{OH})-$ to $-\text{CHO}-\text{CHO}-$, and of $-\text{CH}(\text{OH})-\text{CH}(\text{OH})-$ to $-\text{CH}(\text{OH})-\text{CO}-$.
A. E. S.

Studies on Cellulose Acetate. III—Combination of Sulphuric Acid during the Acetylation of Cellulose and the Mechanism of Acetylation. T. Araki. *Text. Research J.*, 22, 630–636 (Oct. 1952).

The effects of the acetylating conditions on the amount of combined sulphuric acid in cellulose acetate are studied, and it is shown that the combination of sulphuric acid is influenced mainly by the quantity of sulphuric acid present. The mechanism of the catalysis in the acetylation of cellulose, using sulphuric acid as catalyst, is discussed.
A. B.

PATENTS

Wet-strength Paper. J. Knaggs.

BP 683,956
To produce paper of improved wet strength and opacity, an aqueous dispersion of melamine resin and a colloidal inorganic loading material, e.g. TiO_2 , china clay, or barytes, is passed through a colloid mill and added to the beater, so that an enhanced proportion of resin and loading material is incorporated in the finished paper, the pH of the stuff being brought down to 4–4.2 by adding aluminium sulphate or chloride. The process is conveniently carried out in a cylinder mould machine where the backwater can be collected for reuse.
S. V. S.

Photographic Printing Paper. Cassio Photographic Paper Co.

BP 684,040
In producing photographic light-sensitive paper a coating of a dispersion of barium sulphate in a film-forming medium, e.g. gelatin, the coating containing 0.1–1.0% by weight of an anionic, cationic, or non-ionic wetting agent, is applied to a paper base at the rate of 35–60 g. dry wt. per sq. m. of paper. The outer surface of the coating is brought into contact with a smooth highly polished casting surface, e.g. glass, the dispersion being set and dried whilst in contact with the surface, and then the coated paper is separated from it and the coating thus obtained supercoated with one or more coatings of fluid gelatino-silver halide photographic emulsion, which are set and dried.

The process is carried on continuously by feeding the barium sulphate coating mix into the nip between a heated smooth-polished revolving drum and the paper base, allowing the paper to revolve with the drum for part of a revolution, and continuously stripping off the paper base carrying the set and dried coating composition. S. V. S.

Pigmented Paper. R. T. Vanderbilt Co.

USP 2,599,091
Some of the cellulose fibre stock is treated in aqueous suspension with a strong soln. of CaCl_2 , so as to modify the cellulose or lignocellulose. The modified fibres are then treated with a soluble salt, e.g. Na_2CO_3 , to precipitate an insoluble pigment, e.g. CaCO_3 , within and around the fibres. This pigmented stock can then be blended with untreated stock to produce an improved pigmented paper.
USP 2,599,092

The pigmented stock is used as a coating for paper made from untreated stock.
USP 2,599,093

The pigmented fibres are prepared by treating the pulp with CaCl_2 , BaCl_2 , or ZnCl_2 , the amount of chloride used greatly exceeding the weight of the fibres, and then precipitating an insoluble Ca, Ba, or Zn pigment in them by double decomposition with Na_2CO_3 or other suitable soluble salt.
USP 2,599,094

The pigment on the fibres consists of hydrated calcium silicate.
C. O. C.

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

PATENTS

Tanning Agents. Gy.

BP 683,084
The products obtained by heating the reaction mixture from the monosulphonation of phenol, cresol, or anisole above 150°C. under reduced pressure, and then condensing in presence of acid with formaldehyde an urea or thiourea, have tanning properties similar to those of vegetable tanning agents. They yield pure white leather of very good fastness to light and having a soft, full handle.
C. O. C.

Tanning and Bleaching Leather with a Sulphoaryl-melamine-Formaldehyde Resin. American Cyanamid Co.

USP 2,599,142
The water-soluble acid-sensitive condensates of formaldehyde with a sulphoaryl-melamine bleach chrome-tanned leather. They have tanning properties and can be used alone or in conjunction with other tanning agents.
C. O. C.

XIV—ANALYSIS; TESTING; APPARATUS**Specification for Hilger Spekker Absorptiometer**

H 760. R. Taylor, A. F. Williams, and E. S. Dreblow. *Chem. and Ind.*, 1051–1052 (25 Oct. 1952).

Arising from complaints to the manufacturers that the new Spekker Absorptiometer H 760 was inferior to the old model, a specification is defined by which it can be ensured that a straight-line calibration curve obtains with an absorbing soln. which obeys Beer's law. Attendant difficulties make it impossible to specify rigid tests for other factors such as repeatability of readings, freedom from backlash, and photocell fatigue. The specified test, arrived at by joint discussion between Messrs. Hilger & Watts Ltd. and members of the D.S.I.R. Panel for Physicochemical Analytical Methods, employs a soln. of $\text{K}_2\text{Cr}_2\text{O}_7$, and permissible tolerances are defined.
J. W. D.

Use of the Spekker Photoelectric Absorptiometer for the Determination of pH. T. B. Smith, C. A. White, P. Woodward, and P. A. H. Wyatt. *J.C.S.*, 3848–3854 (Oct. 1952).

A method is described which utilises the capacity of the Spekker instrument to measure optical density, and its validity is demonstrated by the accurate determination of pK_{In} values for some common indicators, e.g. the nitrophenols and methyl red. The defining equation for an indicator of the pseudo-acid type is—

$$\text{pK}_{\text{In}} = \text{p}(\text{H}^+) + \log_{10} \frac{[\text{HIn}]}{[\text{In}^-]} + \log_{10} \frac{f_{\text{HIn}}}{f_{\text{In}^-}}$$

and an analogous formula applies for a pseudo-base. The ratio $[HIn]/[In^-]$ is measured by means of the absorptiometer, and $\log ([HIn]/[In^-])$ is calculated from well known approximate equations, so that the relation follows between pK_{In} and $p(H^+)$. Precautions are considered whereby the sum of the errors of measurement and of the assessment of activity effects may be kept within desired limits; pK is then determined to within 0.02 unit.

H. H. H.

Stable Indicator Solutions for Complexometric Determination of Total Hardness in Water.

E. M. Diskant. *Anal. Chem.*, **24**, 1856-1857 (Nov. 1952).

Deterioration of the soln. of Eriochrome Black T (C.I. 203), used as indicator in the complexometric (Schwarzenbach) titration, leads to poor end-points. Numerous attempts by the author and others to obtain stable soln. of the dye are described and discussed. The author cannot offer any theory which would account for the various phenomena observed, and makes the empirical recommendation that the indicator be prepared by dissolving the dye in either di- or tri-ethanolamine without addition of other salts or solvents, and dispensed in dropping bottles which are kept tightly closed when not in use, to avoid uptake of moisture. There is no advantage in protection against light, or in keeping the soln. in a refrigerator.

J. W. D.

Rapid Determination of Starch in Bulk and on Cloth.

V. E. Rostovtsev and Z. I. Maslennikova. *Nauch.-issledovatel. Trudy, Ivanov. Nauch.-issledovatel. Inst. Khlopatobumazh. prom.*, **18**, 109-114 (1951); *Chem. Abs.*, **46**, 9475 (25 Oct. 1952).

Boil 2 g. cloth for 3 min. in 15 ml. of a soln. containing 2 g. Chloramine T, 3 g. neutral catalyst, 3 g. NaOH, and 0.1 g. $CuSO_4 \cdot 5H_2O$ per litre of water. Use the extract for the usual starch determination by acidification with acetic acid and addition of 0.1 N- I_2 , and compare the colour with a standard.

C. O. C.

New Rapid Method for the Estimation of Reducing Sugar in Carbohydrate Hydrolysates.

P. Schornig and V. Jacopian. *Faserforsch. und Textiltech.*, **3**, 437-440 (Nov. 1952).

To 40 ml. of a soln. containing 5-30 mg. of reducing sugars add 10 ml. of a soln. containing, per litre, 35 g. of $CuSO_4 \cdot 5H_2O$, 50 g. of NaOH, and 200 g. of triethanolamine. Boil for 2 min., cool, add 100 ml. of water, then 10 ml. of 5 N-acetic acid, and finally 15 ml. of 0.1 N-Chloramine T. Shake occasionally and, after 3 min., add 11.5 ml. of 0.1 N- Na_2AsO_3 , 1 drop of 0.5 N-KI, and 1 ml. of 1% starch soln., and titrate with 0.1 N-Chloramine T to a persistent pale blue. Carry out a control titration in absence of reducing sugars, using 15 ml. of 0.1 N- Na_2AsO_3 , 1 ml. of 0.1 N-Chloramine T \equiv 2.77 g. of pure glucose. A probable error of < 4% is claimed.

A. E. S.

New Spray Reagents for Paper Chromatography of Reducing Sugars.

L. Sattler and F. W. Zerban. *Anal. Chem.*, **24**, 1862 (Nov. 1952).

Common hexoses and pentoses give stable orange spots with *p*-aminohippuric acid (0.3%) in ethanol, applied for 8 min. at 140°C. The spots fluoresce strongly under ultraviolet illumination, giving a sensitivity under these conditions of 1 μ g. on unirradiated paper. A soln. of phthalic acid (3%) reveals 0.25 μ g. glucose and 1 μ g. fructose under ultraviolet illumination; in ordinary light, four or five times as much sugar is required to give orange-red spots. Under similar conditions, 4-aminoantipyrin has slightly less sensitivity, and must be used at 150°C. for 10 min.

J. W. D.

Two-dimensional Paper Chromatography using One-dimensional Apparatus—Application to Sugars of Spent Sulphite Liquor.

L. A. Boggs. *Anal. Chem.*, **24**, 1673-1675 (Oct. 1952).

Successive irrigations with phenol saturated with water, and with a one-phase mixture of ethyl acetate (9 vol.), acetic acid (2 vol.), and water (2 vol.), by the method described, give a satisfactory resolution of the components which is not obtainable by one-dimensional irrigation. The chromatograms are developed by spraying with a soln. of *p*-anisidine (0.2 g.) and trichloroacetic acid (1.0 g.) in water (50 ml.), and then heating in an oven at 100-150°C. Preparation of the sugar fraction of spent sulphite liquor for chromatographic resolution is described. The principal components were found to be xylose, arabinose,

mannose, glucose, and galactose; fructose was not detected. Other carbohydrate constituents are also present, and the investigation is being continued.

J. W. D.

Differentiation of Carbohydrates by Anthrone Reaction Rate and Colour Intensity.

L. H. Koehler. *Anal. Chem.*, **24**, 1576-1579 (Oct. 1952).

When a carbohydrate is heated with anthrone and conc. H_2SO_4 , a green coloration is produced which attains a max. intensity and then diminishes. The value of this max. and the time required to reach it, at const. temp., are characteristic of carbohydrates. Under the test conditions described (heating at 98°C. and measuring the resulting colour photocolometrically using a red filter) aldohexoses gave readings of 110-165 Klett units per 100 μ g. after 5-10 min., ketohexoses gave 220-270 units per 100 μ g. after 1-2 min., and pentoses 40-70 units per 100 μ g. after 1-2 min. These were the max. values. Polymers react as do the constituent sugars, whilst derivatives develop the decreased amount of colour expected from the content of inert component. It is described how the method may be used to indicate the probable identity (or non-identity) of polysaccharides, to estimate the carbohydrate portion of a mixture or complex, and even to provide evidence of the nature of the carbohydrate components of a complex.

J. W. D.

New Method for the Analysis of Hydrosulphite.

L. I. Belenky and M. E. Kazanskaya. *Tekstil. prom.*, **12**, 35 (June 1952).

To determine hydrosulphite, e.g. in a vat dyebath, a measured sample from the bath is added to excess of a soln. of an azo acid dye (Acid Red 8, C.I. 184) which gives colourless products on reduction, and the soln. is examined colorimetrically, after filtering off any precipitated vat dye.

A. E. S.

Determination of Chromium by Oxidation in the presence of Silver Nitrate.

S. Lynn and D. M. Mason. *Anal. Chem.*, **24**, 1855 (Nov. 1952).

By digestion with a mixture of fuming $HClO_4$ and H_2SO_4 in presence of $AgNO_3$ at 200-220°C. a more quantitative oxidation of small amounts of Cr^{3+} is obtained than by other available methods. The final titration of chromate is iodometric. The mechanism by which the $AgNO_3$ assists is not known. Quantities ranging from 0.1 to 10 μ g. Cr may thus be determined with a deviation of < 1%. The method, which is fully detailed, includes precautions against loss of Cr by volatilisation.

J. W. D.

Study of the Diphenylamine Test for Aliphatic Nitro Compounds.

K. Grebber and J. V. Karabinos. *Bur. Stand. J. Res.*, **49**, 163-166 (Sept. 1952)—

Research Paper 2353.

Experimental details are given of the application of the diphenylamine test to various aliphatic nitro compounds. The test is at least 1000 times more sensitive than previously supposed. Spectroscopic measurements indicate that the blue colour is similar to that produced by oxidising agents. It is probably due to phenazine and benzidine derivatives. A possible free-radical mechanism for the reactions involved is suggested.

J. W. D.

Reaction of Sulphonation. XXI—Quantitative Estimation of Certain Naphthalenedisulphonic Acids.

A. A. Spryskov and B. I. Karavaev. *J. Gen. Chem. U.S.S.R.*, **22**, 1620-1624 (Sept. 1952).

The reaction mixture (1 g.) from the disulphonation of naphthalene is dissolved in water, neutralised with 0.5 N-NaOH, made up to 175 ml. with water, and brought to the boil. 10% aq. $BaCl_2$ (25 ml.) is added, and after a few min. a soln. (50 ml.) containing 1 g. of benzidine and 1.25 ml. of conc. HCl (sp. gr. 1.19). The soln. is boiled for a short time, cooled to 60-65°C., and filtered at this temp. The precipitate contains the benzidine salt of the 1:5- (low-temp. sulphonation) or 2:6-disulphonic acid (high-temp. sulphonation); it is washed free from Cl^- and then estimated by titration with 0.1 N-NaOH, using phenolphthalein as indicator. On cooling the filtrate in ice, the benzidine salt of the 2:7-disulphonic acid separates out and can be estimated in the same way. The separation of the 1:5 and of the 2:6 acids is almost quantitative, but precipitation of the 2:7 acid is not quite complete, and a correction must be applied. Tests on artificial mixtures show that when using duplicate estimations the probable error is < 1% for the 2:6 and < 2% for the 1:5 and 2:7

acids (on total sulphonic acid content). The method permits the separate estimation of the 1:5 (or 2:6) and 2:7 acids in presence of the 1:3, 1:6, and 1:7 acids. A. E. S.

Determination of Sodium Chloride, Sulphate, and Carbonate in Coal-tar Dyes. M. Kitayama. *Bunseki to Shiyaku* (Chem. Analysis and Reagents), **2**, 195-196 (1948); *Chem. Abs.*, **46**, 10,049 (10 Nov. 1952).

Shake 25 g. activated carbon neutral and free from Cl^- and SO_4^{2-} with 250 ml. of 1% KNO_3 for 15 min.; then add 250 ml. of 0.5% dye soln. Shake for 15 min. and filter. Test the colourless filtrate for Cl^- , SO_4^{2-} , and CO_3^{2-} as usual. C. O. C.

Textile Testing Methods. Swiss Standards Association. *Amer. Dyestuff Rep.*, **41**, P 701-P 717 (27 Oct. 1952).

Translation of papers published in German in *Textil-Rundschau* (see J.S.D.C., **65**, 323 (1949); **66**, 166, 256, 463, 504, 666, 667 (1950); **67**, 52, 132 (1951); **68**, 235, 484, 543, 544 (1952)).

Relation between Intrinsic Viscosity and Degree of Polymerisation. W. G. Harland. *Nature*, **170**, 667 (18 Oct. 1952).

Though there is general agreement that the relation between intrinsic viscosity and degree of polymerisation (D.P.) is usually of the form $[\eta] = K(\text{D.P.})^a$, there is still controversy regarding the numerical values of K and a for a particular system. When osmometry is used to determine the D.P. of a nearly homogeneous fraction, significant error may arise if the densities of the polymer soln. and of the solvent are not taken into account. The correction required is much larger for the Fuoss-Mead osmometer than for the Schulz type, and has a more pronounced effect upon the relation between intrinsic viscosity and D.P. when the D.P. is high. An example is quoted of soln. of cellulose nitrate (D.P. 100-1800) for which the values of K and a were changed, upon correction, from 0.0154 and 0.93 to 0.0108 and 1.0 respectively. J. W. D.

"Double Fronting" in Paper Chromatography of Proteins. H. G. Bowman. *Nature*, **170**, 703-704 (25 Oct. 1952).

Experiments in paper chromatography indicate a "double fronting" effect, apparently the result of a displacement which greatly influences the movement of the protein. Photographs are shown of the phenomenon when using serum albumin. J. W. B.

Indicator Spray for Amino Acids. A. R. Kemble and H. T. Macpherson. *Nature*, **170**, 664 (18 Oct. 1952).

In quantitative one-dimensional paper chromatography of amino acids, the use of a spray consisting of formalin (3 ml.), 60% aq. KOH (0.1 ml.), and 0.15% (wt./vol.) bromothymol blue (20 ml.) in 95% alcohol, followed by a neutral solvent such as propanol-water, gives better definition than either the running of reference strips, or the use of a ninhydrin spray. The amino acids show as yellow bands against a blue (alkaline) background. J. W. D.

Some Factors influencing the Quantitative Determination of Amino Acids separated by Circular Paper Chromatography. K. V. Giri, A. N. Radhakrishnan, and C. S. Vaidyanathan. *Anal. Chem.*, **24**, 1677-1678 (Oct. 1952).

Traces of copper markedly affect the tone and intensity of the alcoholic extracts of the ninhydrin-stained bands. Addition of 0.2 mg. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in 4 ml. alcoholic eluate produces the max. effect, and gives direct proportionality between colour density and amino acid concn. over the range 2.5-12.5 μg . Asparagine may be determined at low concn., as the added Cu greatly increases the colour density. J. W. D.

Distinguishing between Perlon and Nylon. H. Ludewig. *Faserforsch. und Textiltech.*, **3**, 354-356 (Sept. 1952).

Polycaprolactam fibre (I, e.g. Perlon I) dissolves in 4-2 N-HCl at room temp., whereas nylon 66 (II) dissolves only on heating; other synthetic fibres, e.g. Perlon U, Terylene, Orlon, and nylon 610, are not sol. Mixed yarns or fabrics are treated with the cold acid for a short time, and a turbidity formed on diluting the acid indicates I; if I is absent, a short boil in the acid is given, and a turbidity on dilution indicates II. The composition of fibres prepared from mixtures of I and II can be determined approx. from their m.p. with the aid of the m.p.-composition diagram, which is given. An accurate determination can be made by boiling ~20 g. of fibre for

2 hr. with 100 ml. of 20% HCl under reflux. The diamine formed, which is equiv. to the amount of II present, is liberated by adding alkali and determined by distilling over into excess of acid in the usual way. A. E. S.

Determination of Azotols.* V. E. Rostovtsev and Z. I. Maslennikova. *Nauch.-issledovatel. Trudy, Ivanov. Nauch.-issledovatel. Khlophatobumazh. prom.*, **18**, 115-118 (1951); *Chem. Abs.*, **46**, 9473 (25 Oct. 1952).

Pure Azotol A, m.p. 243.7°C., in 4.5% NaOH couples satisfactorily enough for colorimetric determination with diazotised sulphanilic acid. Dissolve 0.1 g. of Azotol A in ethyl alcohol and add 0.4 ml. of 4% NaOH. To 25 ml. of the resulting solution add 6 ml. of diazotised sulphanilic acid, 60 ml. of 80% ethyl alcohol, and 20 ml. of 4% NaOH. Dilute to 200 ml., and compare with standards prepared from pure Azotol A. The sulphanilic acid soln. used consists of 8 g. sulphanilic acid and 18 ml. 8N-HCl in 100 ml. hot water, cooled with ice to 5°C., treated with 3 g. NaNO_2 in 20 ml. water, allowed to stand for 30 min., filtered, and diluted to 1000 ml.; immediately before use the solution is neutralised to Congo red with sodium acetate. C. O. C.

* Azole coupling components

Evaluation of Damage caused in Aniline Black Dyeing. P. V. Gorshkov. *Ivanov. Nauch.-issledovatel. Inst. Khlophatobumazh. prom., Nauch.-issledovatel. Trudy*, **18**, 119-122 (1951); *Chem. Abs.*, **46**, 9850 (25 Oct. 1952).

Physical methods are not sensitive enough, and a better method is to determine the ferricyanide No., which increases with increase in cloth damage, as oxycellulose has greater reducing power than hydrocellulose. Normal bleached cloth has ferricyanide No. approx. 0.3; after Aniline Black dyeing and steaming, with loss in strength ca. 10%, the No. is 3-5, greater values indicating abnormal loss in strength. The 1-g. sample is boiled for 5 min. in 125 ml. distilled water, treated with 25 ml. 10% NaOH, boiled for 1 hr., and filtered, the filtrate then being diluted to 250 ml.; a 50-ml. aliquot is treated with 5 ml. of 0.1 N-potassium ferricyanide, refluxed for 30 min., during which it is treated with 4-5 drops of methylene blue soln. (5 g./litre), and titrated with glucose soln. (3 g./litre) until the blue disappears. The results are expressed in ml. of 0.1 N- $\text{K}_3\text{Fe}(\text{CN})_6$ used by the 1-g. pattern. C. O. C.

XV— MISCELLANEOUS

Pencils—I. M. Kawasaki. *Rept. Osaka Pref. Ind. Research Inst.*, **1**, 32-39 (1949); **II.** M. Kawasaki, A. Yasumori, and T. Honda. *Ibid.*, **2**, 61-67 (1950); *Chem. Abs.*, **46**, 11,510 (25 Nov. 1952).

I—Polarographic analysis of the graphite for the best Japanese pencils showed that it contained considerable amounts of Fe, Si, Mg, Ti, Cu, and Al, less Mn and Cr, small amounts of Rb, Na, and Ba, and a trace of Ni. Under the electron microscope sealy graphite showed mainly 5-15- μ . granules and earthy graphite 0.1-0.5- μ . granules; they are equally suitable for pencils.

II—The blackness of pencil marks on various papers was graded according to transparency. The graphite particles were observed microscopically in the cut surface of the pencil core after polishing and etching with 50% HF. The montmorillonite clay kneaded with the graphite was studied under the electron microscope, and tested for plasticity by dispersing it in water. C. O. C.

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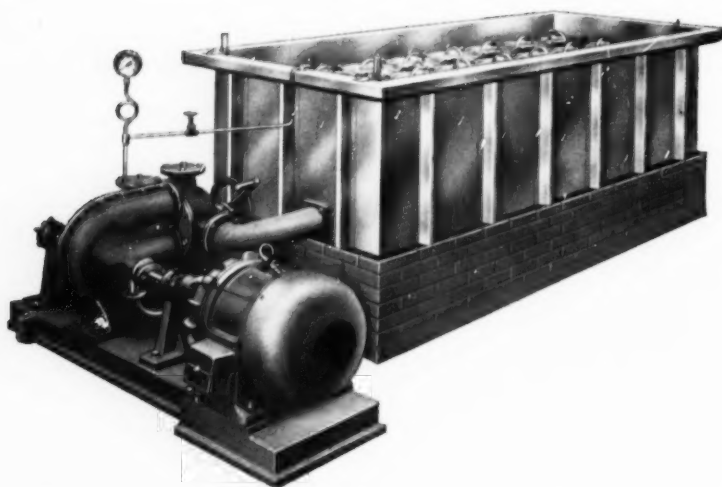
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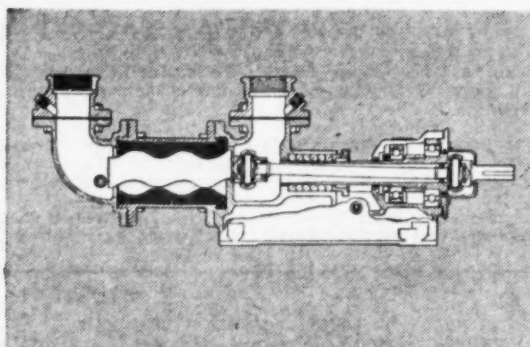
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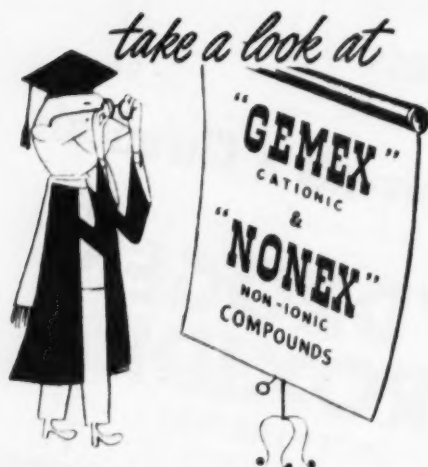
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